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CONTAINERIZATION OF UNIT EQUIPMENT
DURING SURGE DEPLOYMENTS

by

Bruce E. Green, Jr.

March 1993

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CONTAINERIZATION OF UNIT EQUIPMENT DURING SURGE DEPLOYMENTS

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ABSTRACT

The purpose of this thesis is to examine issues and concerns resulting from the utilization of containers to transport unit equipment during surge phase deployments and to appraise transportation decision-makers of potential problem areas. This thesis provides an overview of container operations during Operation Desert Shield/Desert Storm. It examines the effects of containerization of unit equipment on unit integrity from both the unit commander and the transportation provider perspectives. It examines container policy, availability and supply, and militarily useful configurations. The use of procured and leased containers is examined and potential costs and benefits associated with each method, as well as the effects on the container market as a whole, are assessed. Tracking capabilities and visibility of in-transit containers are also examined from both the military and commercial perspective.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I. INTRODUCTION

Military containerization is predominantly a one-way movement from the United States to overseas bases and operating forces. For the most part, these requirements are handled in peacetime by private containers and containership services. Only in an emergency, such as a NATO or Arabian Gulf conflict, would container problems become acute. Department of Defense containers (such as MILVANs) would be activated in the early stages of the emergency, but their relatively limited numbers would require additional container capacity very quickly. (Saunders, 1986)

A. BACKGROUND

In June 1920, the Jones Act was passed in order maintain a Merchant Marine of the best-equipped and most suitable types of vessels, sufficient to carry the greater portion of American commerce and to be owned and operated by U.S. citizens. (Stopford, p.143)

The Jones Act was a manifestation of the belief that transportation is a vital element in ensuring the nation's defense. The military must be able to move personnel and equipment quickly, and as the act points out, efficiently and effectively, using the vessels specified above. The United States has relied on seapower since the Revolution to defend and protect its national interests and commercial shipping has always been a key player in this strategy.

Since the Jones Act was passed, four major national defense crises have been contended with that required the extensive use of commercial shipping assets. During the first three of those, the "best-equipped and most suitable vessels" were break-bulk because that is what was available in commercial industry. That changed with Operations Desert Shield and Desert Storm. Break-bulk ships were no longer the shipping industry standard. Containerships had taken over the liner routes due to their lower costs and greater capacity.

Strategic sealift transported between ninety and ninety five percent of all dry cargo and ninety nine percent of petroleum required for the Korean War, Vietnam, and Operations Desert Shield and Storm (Sowers, 1991). The vast majority of this sealift was transported on commercial vessels. Prior to Operations Desert Shield and Desert Storm, dry cargo was transported primarily in break-bulk ships.

Starting in the late 1960's, and throughout the 1970's and 1980's, break-bulk vessels were largely replaced by containerships due to the containerships' lower operating costs and substantially increased productivity.

The shift to containerships transformed the makeup of the United States Merchant Marine upon which the Department of Defense depends for its strategic sealift. Some view containers as both economical and efficient. Others feel they are a hinderance during a surge phase, when personnel and material

must be rapidly deployed, and containers are felt to be an additional burden.

The Department of Defense has made past use of container technology, but not nearly as drastically as has the commercial market. The use of "containers" is not new to the military. The CONEX box (short for Container Express) is a result of attempting to solve pilferage and damage problems experienced during World War II with small and high value items. CONEX boxes are metal, are mounted on skids to allow use with forklifts, and have recessed lifting eyes. They come in two sizes: 6'3"W X 6'10"H X 4'3"L and 6'3"W X 6'10"W X 8'6"L. (Sowers, 1991)

CONEX boxes were first used during the Korean Conflict, and saw extensive use during the Vietnam War. In fact, CONEX boxes were the "backbone of logistics support" during that war. (Sowers, 1991) They were a great success as their concept was to keep material together until it reached its destination. Unfortunately, most CONEX boxes are approaching the end of their service lives and require replacement. [Jordan 24th Infantry, interview, 1992]

In addition to CONEX boxes, MILVANs are also in use. MILVANs conform to International Standards Organization (ISO) container standards and are a 20 foot equivalent unit (TEU). There are two types of MILVANs in the inventory, a dry cargo version and a munitions version. MILVANs are also facing the

same problem as the CONEX box--age--and many are at the end of their serviceable lives as well.

Both the CONEX box and MILVAN were designed to have ready access to multi-modal transport and to be transported via motor transport, rail, surface vessel, or aircraft. The smaller of the CONEX boxes could also be moved by a gang of soldiers, so it has a fourth transportation facet as well (for very short distances). Both the MILVAN and CONEX box are used for the same reason as containers in the commercial market - to avoid handling individual pieces of material and for protection of items from damage and pilferage. Coupled with this shift, substantial political pressure has been brought to bear to reduce the Department of Defense, especially overseas bases, with the ending of the Cold War. The "peace dividend" will most likely include the closure of many overseas bases of operations and the stationing of previously forward-deployed troops and capabilities in the Continental United States (CONUS). The CONUS based force structure is predicated on rapid deployment to an Area of Operation (AO). This new policy underscores the need for rapid, effective and efficient strategic sealift, especially in the initial, or surge, phase of a deployment.

B. PROBLEM

Military cargo is comprised of the same basic elements it was a half century ago: Combat, Combat Support, and Combat

Service Support. The hurdle facing modern logisticians is how to transport unit equipment, normally break-bulk in nature, using a Merchant Marine that now largely utilizes container-ships to transport dry cargo. This thesis will explore several questions surrounding the potential use of containers to transport unit equipment during the initial, or surge, phase of a deployment. These questions include:

- What types of ships will be available from the Merchant Marine in the future?
- Will unit commanders accede to use of containers?
- What effect does containerization have on unit integrity?
- What types of containers are most military useful and necessary?
- How should containers be maintained? Leased? Owned?
- How will containers be tracked?
- What conditions could preclude container usage for a contingency?

C. SCOPE, LIMITATIONS AND ASSUMPTIONS

The scope of the thesis will focus on the Army's use of container technology because the Army is viewed as the major consumer of sealift capability. Both the Air Force and the Navy, including the Marine Corps, have indigenous lift and container capabilities and, for the purpose of this thesis, are viewed as logistically self-supporting.

This thesis will primarily be of an informational and policy-oriented nature. It is envisioned that those who may

read or use it will be familiar with the technical terms and language associated with both the transportation and container fields.

It will also assume that U.S. Merchant Marine vessels and those under Effective U.S. Control (EUSC) will continue to play an integral and vital part of any future sealift contingency operation because of both fiscal budgeting and National Defense considerations. While Military Sealift Command has moved forward with procurement of additional Fast Sealift Ships (FSS) and Strategic Sealift Ships (SSS) for the Ready Reserve Fleet (RRF), it is assumed that they will be used for initial surge deployments of combat units, but will be significantly augmented shortly after the contingency arises for the transportation of the other combat and combat support elements.

D. METHODOLOGY

This thesis examines the use of containers and containerships in the transportation of surge Combat, Combat Support, and Combat Service Support requirements. A formulation of future logistical operations utilizing container technologies will be sought in order to enhance the efficient and effective transfer of surge unit equipment to an AO.

A significant amount of information was obtained from personal interviews with those individuals assigned to major transportation commands who were involved in Operations Desert

Shield and Desert Storm logistical planning and operations. Information was obtained from United States commercial shipping firms that provided container services. A large quantity of written information such as reports, reviews and policy proposals were obtained from U.S. Transportation Command (USTRANSCOM), Headquarters, Military Transportation Management Command (MTMC) and MTMC's Transportation Engineering Agency (TEA).

E. ORGANIZATION OF THESIS

Chapter II will provide an overview of container and sealift capability used during Operations Desert Shield and Desert Storm.

Chapter III will contain an examination of unit integrity, unit commander concerns about unit integrity, as well as those of transportation commands responsible for providing sealift.

Chapter IV will examine container policy, supply and availability. It will examine container availability and market force changes when the Department of Defense enters the container market. Inventory questions will also be examined with regard to owning/leasing and relying on industry.

Chapter V will discuss container configurations and examine militarily useful designs.

Chapter VI will examine tracking systems and the requirement to accurately trace and retrieve containers as specified by unit commanders.

Chapter VII will be comprised of the conclusion and recommendations for the future.

II. OPERATIONS DESERT SHIELD AND DESERT STORM

On 2 August 1990, Iraq invaded Kuwait and captured that country shortly thereafter. In response to the invasion, a no-notice deployment to Southwest Asia was undertaken for the purpose of liberating Kuwait. Operations Desert Shield and Desert Storm saw the first large scale use of the commercial container industry by the Department of Defense. Deployments of material for a contingency of this size had not been undertaken since the Vietnam War. The distance to the Area of Operation (AO) was approximately 8700 nautical miles from U.S. ports. Due to the immensity of the lift requirements and distances involved, most of the nation's air and sealift assets were extensively used. (Rost, Addams, Nelson, p. 1)

A. BACKGROUND

Desert Shield and Desert Storm logistical efforts were divided into four phases. Phase I was the period 7 August through 7 November 1990. This phase was characterized as "Initial Deterrence". It was essentially a stopgap measure to preclude further gains by Iraqi forces. Phase II was the period 8 November 1990 through 15 January 1991. It was characterized by a buildup of strength leading up to the offensive stage. Phase III was the period 16 January through 28 February 1991. It was the offensive stage of the operation. Phase

IV was the period from 1 March 1991 forward. It was the period of redeployment of equipment to homeports.

Phases I and II were closely associated with "surge" deployment of units. A surge is the initial stage of deployment of equipment and personnel in a contingency operation. There is no time period specifically designated as "surge", however, the first fourteen to twenty one days have been used by some activities. (Lennon, MTCM-TEA, Interview, Jul 1992) While the entire period cannot be classified as wholly surge, there were significant elements of it in both of the phases as the strategy changed from one of defense to that of offense. It is toward these two phases that focus will be directed.

During Phases I and II, 294 ships were involved in the sealift of unit equipment and related support. (Rost, Addams, Nelson, p. 3):

- 25 ships of the Afloat Prepositioning Force, including all 13 Maritime Prepositioning Ships (MPS) carrying Marine equipment, 8 prepositioning (PREPO) ships carrying Army and Air Force cargo, and 4 tankers in the PREPO force.
- 8 Fast Sealift Ships (FSS).
- 70 Ready Reserve Force (RRF) ships.
- 191 chartered dry cargo ships: 29 flying the U.S. flag or under effective U.S. control (EUSC), and 162 of foreign flag and control.

Desert Shield and Desert Storm saw the most intensive buildup and logistical efforts since Vietnam. Table 1 compares rates for the last three major national contingencies.

Table 1 DRY CARGO DELIVERED[a,b] BY AIRLIFT AND SEALIFT DURING THE THREE MAJOR CONFLICTS

	Monthly rate[c] (short tons) First Year	Peak Year
Operation Desert Shield/Storm	510,000	-
Vietnam War[d]	153,000	523,000
Korean War[d]	385,000	400,000

a. Sources for Desert Shield/Storm data are the Military Sealift Command (MSC) and the Military Airlift Command (MAC). Southeast Asia data are from OSD's Joint Logistics Review Board's 18-volume survey of logistics in the Vietnam War [2]. Korean War data are from CINC-PACFLT's periodic Evaluation Reports on U.S. Pacific Fleet operations in the Korean War [3,4].

b. Airlift data reflect deliveries by MAC or its predecessor, the Military Air Transportation Service (MATS). Sealift reflects MSC deliveries or its predecessor, the Military Sea Transport Service (MSTS) and includes all Navy-controlled U.S. and foreign charters. In addition, the Desert Shield/Storm data include the contributions of afloat prepositioned forces.

c. Monthly rates are an average of aggregate deliveries over a year of less, depending on the availability of the data. For Desert Shield/Storm the average is based on deliveries through 19 February 1991. For Southeast Asia, the first-year rate is the monthly average over 1968. For Korea, the first-year rate is from July 1950 through June 1951 for airlift and November 1950 through April 1951 for sea-lift. The peak-year rate for Korea is from calendar 1952 by MSTS and MATS.

d. Southeast Asia and Korean War sources used measurement tons for sealift deliveries. For comparative purposes, these were converted to short tons using a factor of 0.5 short ton per average measurement ton.

Source: Sealift in Operation Desert Shield/Storm: 7 August 1990 to 17 February 1991, Center for Naval Analysis

Tables 2 and 3 provide comparative data on the sealift and airlift portions of Phases I and II.

Table 2 COMPARISON OF DRY CARGO LIFT DURING DESERT SHIELD (SHORT TONS)

	Sealift	Airlift	Total
Phase I	1,170,000	182,500	1,352,500
Phase II	1,675,000	304,000	1,979,000
Total	2,675,000	486,500	3,331,500

Source: Sealift in Operation Desert Shield/Desert Storm: 7 August 1990 to 17 February 1991, Center for Naval Analysis

Table 3 SEALIFT DELIVERIES DURING DESERT SHIELD (SHORT TONS)

	Unit equipment and support	Sustaining supplies	POL
Phase I	1,034,900	135,100	1,800,000
Phase II	1,270,300	404,700	3,500,000
Total	2,305,200	539,800	5,300,000

Source: Sealift in Operation Desert Shield/Desert Strom: 7 August 1990 to 17 February 1991, Center for Naval Analysis

B. JOINT OPERATIONS PLANNING

In order to conduct military operations, it is essential that detailed plans are prepared and ready for use, should a contingency arise. One of the methods by which plans are formulated is through Joint Operations Planning.

> Joint operations planning includes contingency planning, execution planning, and implementation planning. In peacetime, the planners prepare contingency plans, either when directed by the Chairman, Joint Chiefs of Staff (CJCS) or

to accomplish other missions not specifically assigned by the CJCS but determined by the combatant commander to be necessary. Joint operation plans tasked by the CJCS are reviewed by the Joint Staff and approved by the CJCS. The approved operation plans of the CINCs represent the national plans for major contingencies and transition to war. When directed by the Secretary of Defense, through the Chairman of the Joint Chiefs of Staff, the joint operation plans are converted to joint operation orders and implemented by the CINCs. During crisis situations, the CINCs develop courses of action in response to specific situations or taskings and prepare joint operation orders to execute courses of action approved by the National Command Authority (NCA). (Talley and Vigneron, p. 7-8)

Operation Plans in Complete Format (OPLANs) are a complete and detailed operation plan including a full description of the concept of operations and all annexes applicable to the plan. It identifies the specific forces, functional support, and resources required to execute the plan and provides estimates of final numbers and scheduling for their movement into theater. The OPLAN can be used as the basis for quickly developing an operations order. An OPLAN is normally prepared when the contingency is critical to national secruity and would tax the total resources available to deterrence by demonstrating readiness through planning, or when detailed planning is reequired, to support alliance planning. (Talley and Vigneron. p.9)

OPLANs have Time-Phased Force Deployment Data (TPFDD) associated with them. TPFDDs (Appendix B, AFSC Pub 1, 1991) include data on:

- Units to be employed.
- Units to be deployed to support the OPLAN, with a priority indicating desired sequence for their arrival at ports on a given day.
- Routing of forces to be deployed.
- Mobility data associated with deploying forces.
- Non-unit-related personnel and cargo movements to be conducted concurrently with deployment of forces.

The TPFDD is supposed to reflect the units, equipment, material, and numbers of personnel which are required in order

to carry out the mission set forth in an OPLAN. Very often, equipment and personnel changes are made regarding OPLANS. These changes are required to be entered into the TPFDD process so that new TPFDDs can be generated reflecting the latest changes.

Because Desert Shield and Desert Storm did not fit any available OPLAN, essentially a new TPFDD was built as the situation unfolded. That reality, when coupled with the fact that OPLANs have not been used in the last three contingencies (Grenada, Panama, Desert Shield/Storm), have many people questioning the usefulness of the process. (Fox, ODSCLOG, Interview, Jul 1992) The OPLAN that most closely resembled Desert Shield/Storm, OPLAN 1002-88, had been deemed "not transportation feasible" by the Joint Operation Planning and Execution System (JOPES) and "the successor plan -- OPLAN 1002-90 -- had not been approved, nor had the TPFDD been examined for transportation feasibility." It was nonetheless used as the "applicable directive for Desert Shield." (Rost, Addams, Nelson, p 13)

The successor TPFDD caused significant problems for those commands responsible for ensuring that the transportation required by it was available. Military Sealift Command (MSC) was tasked to ensure availability of sealift for TPFDD material that did not resemble what was actually going to the theater. Both MSC and the Military Traffic Management Command (MTMC) had two significant difficulties with the new TPFDD:

- It was inaccurate with respect to identification of units to be lifted, their cargo requirements, and ports of embarkation. The problem was particularly severe with respect to combat support and combat service support (CS/-CSS) units. Literally hundreds of reserve units were included in the TPFDD that were never alerted and never called.

- Dates specified for in-theater arrivals were unrealistic, particularly in view of the fact that Desert Shield commenced with little warning time. (Rost, Addams, Nelson, p. 13)

Rost's findings were borne out in interview after interview of MSC and MTMC personnel involved with this situation. Input coming from the field through the Transportation Coordinator Automated Command and Control Information System (TC-ACCIS) varied widely from the TPFDD-specified requirements. Differences of 50 percent were not uncommon. (Fields, MSC-HQ, Interview, Jul 1992) These differences had tremendous impact on the ability of MSC to procure/coordinate the required sealift assets. If the differences between the TPFDD requirements and those coming in from the field through the TCACCIS reporting system were within 10 percent, a lift was scheduled. Even with that policy, many vessels sailed partially filled because of this situation. In many cases, the actual amount of lift required was not determined until the units were ready to move, or in some cases, when they actually reached the Port of Embarkation (POE). Growth in equipment was tremendous as unit vehicles went out combat loaded because of the possibility of having to fight coming directly off the ships. Addi-

tionally, MSC performance was being gauged against performance parameters of the TPFDD for OPLAN 1002-90, which was inaccurate to begin with. (Fields, MSC,HQ, Interview, Jul 1992)

C. READY RESERVE FORCE

The Ready Reserve Force (RRF) is an integral part of the surge deployment process. Its purpose is to ensure sealift is available for a contingency. Depending on the size of the contingency, the RRF can be augmented with commercial vessels that are chartered or requisitioned by MSC. Vessels in the RRF are designed to be ready for activation and available for lift within certain timeframes from the date of callup. Once activated, they would be used to transport Unit Equipment to the Area of Operation. Desert Shield and Desert Storm were the first actual tests of the RRF in some time.

The initial performance of RRF vessels indicates that the use of containerships could have been an immense aid in getting the surge forces deployed quicker. As shown in Figures 1 and 2, the RRF ships that were activated were not available as designed, due in part to their age and material condition. (Operation Desert Shield/Desert Storm, Mitre Corp, May 1991)

MSC's contingency response (CORE) program did not incorporate the commercial shipping industry. Both MTMC and MAC contingency programs do involve commercial carriers. The effect of this lack of incorporation was a factor in having no military cargo moved by commercial carriers in approximately

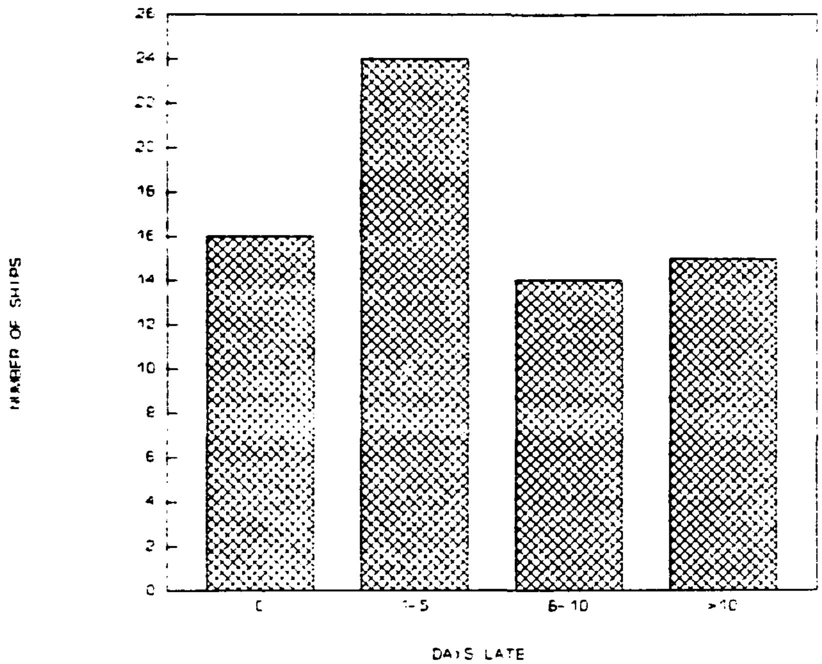


Figure 1 RRF Performance August 2-31, 1990
Source: Operation Desert Shield/Desert Storm
Mitre Corporation

three weeks following the Iraqi invasion. (American President Lines, White Paper, May, 1991) This placed additional pressure on the RRF, FSS's, prepositioned ships and military aircraft already in place.

D. PHASES

Because Desert Shield and Desert Storm were no notice deployments and there was no exact OPLAN that fit the scenario, the response to the crisis and logistical efforts made were put together as the situation developed. Phase I can be differentiated from Phase II in its planning. Phase I was more reactionary in nature because the situation did not fit

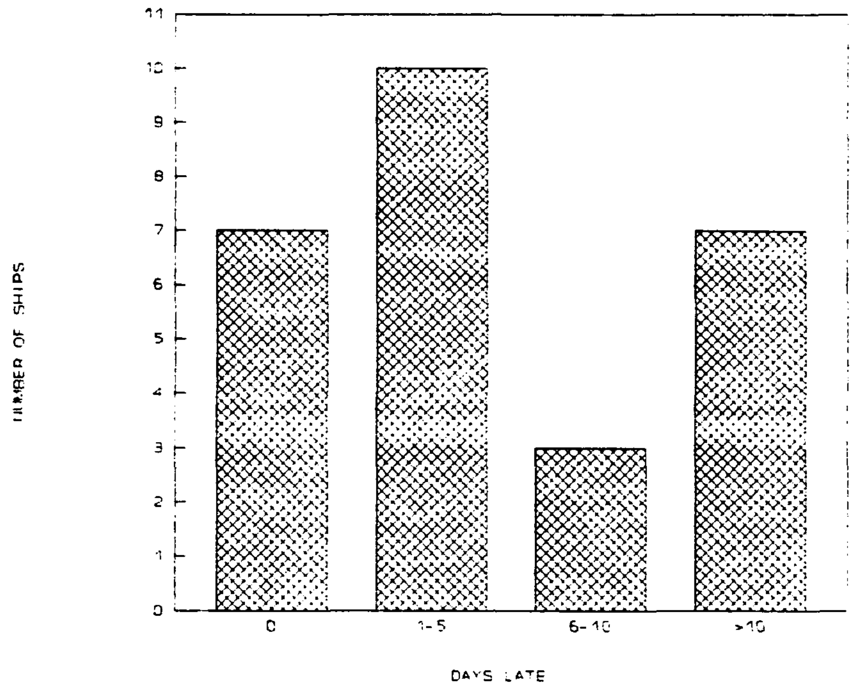


Figure 2 RRF performance September 1, 1990 - January 28, 1991
Source: Operation Desert Shield/Desert Storm
Mitre Corporation

any of the 'off the shelf' OPLANs. Phase I was characterized by rapidly escalating increases in requirements, as shown in Figure 3. Requirements nearly trebled between C+9 and C+48. The OPLAN that was followed was the best, one that approximated the actual situation. During this phase, four Army divisions, a Marine Expeditionary Force, roughly 1,000 combat aircraft, 60 Navy ships and 240,000 personnel were transported to Southwest Asia. Phase II had more planning because there was time available to react in a more methodic manner. Table 4 provides ship utilization profiles for the two phases.

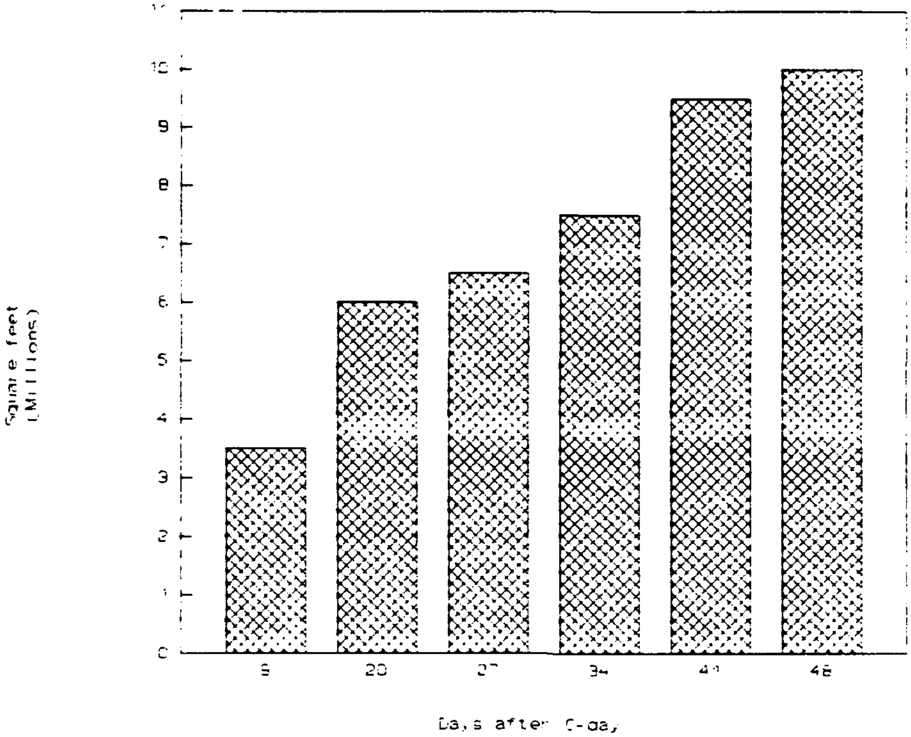


Figure 3 Sealift requirements for August and September
Source: Sealift in Operation Desert Shield/Desert Storm:
7 August 1990 to 17 Fegruary 1991, Center for Naval Analysis

Figure 4 displays the Dry Cargo Profile for cargo moved during phases I and II.

E. CONTAINERIZATION

Containers were used for the transportation of both surge and sustainment material. The containers used during the initial surge were virtually all military owned containers. However, the vast majority of containers were used in the sustainment role. These containers were commercially owned

Table 4 SHIP UTILIZATION IN PHASES I AND II.

	MPS	PREPO	FSS	RRF	Charters U.S.	Charters Foreign
Phase I ships making:						
One delivery	3	4	0	27	12	42
Two deliveries	6	4	2	11	5	3
Three deliveries	0	0	5	0	0	0
Phase II ships making:						
One delivery	5	5	2	35	22	114
Two deliveries	3	0	5	12	6	5
Threee deliveries	0	0	0	0	0	0

Source: Sealift in Operation Desert Shield/Storm: 7 August 1990 to 17 February 1991, Center for Naval Analysis

containers carried on commercial routes. Approximately 20 percent of the dry cargo tons transported during Desert Shield and Desert Storm were containerized. Figure 5 illustrates the sealift and airlift of that dry cargo.

Shortly after the Iraqi invasion, Military Sealift Command contacted U.S.-flag liner operators and invited them to a meeting at MSC to discuss terms of contracts in support of Desert Shield. Negotiations commenced shortly thereafter. The Special Mideast Service Agreement (SMESA) resulted. The SMESA established "rates and terms of shipping containerized supplies from origin to destination," however bookings did not start for three weeks while the SMESA was organized. (Lennon, MTMC-TEA, Interview, Jul 1992)

The volume of military container traffic in the early weeks after bookings commenced was 250-300 FEU's per week.

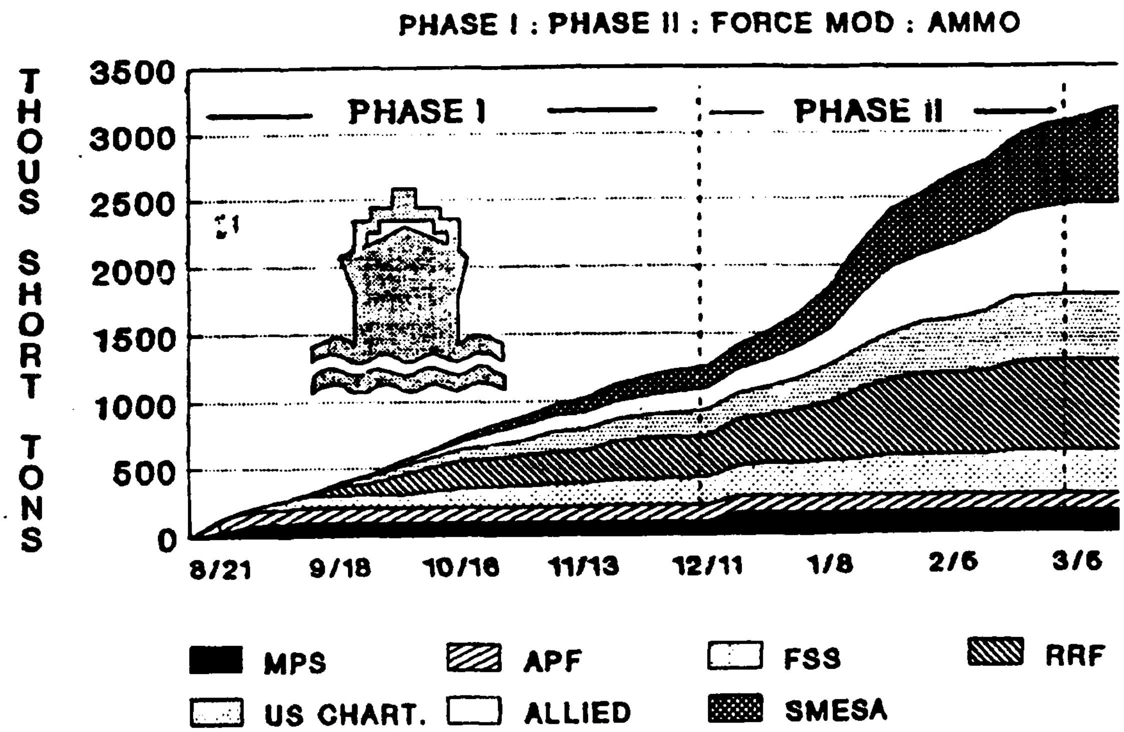


Figure 4 Desert Shield Dry Cargo Profile
Source: Operation Desert Shield/Desert Storm
Mitre Corporation

This rose to 3,300 FEU's by early February 1991. Volume forecasting by the military was difficult because of the unknown nature of the contingency. This resulted in "no-show or late-show cargo" bookings that ran as high as 25 percent. (American President Lines, May 1991)

One of the hurdles faced by commercial carriers was the need to submit "lengthy filings" each time they wanted to adjust the "size and deployment of feeder and line-haul" services that were in support of military requirements. Granted these filings were rapidly approved by the Maritime Administration (MARAD), however the time required, which was not insignificant, for this administrative requirement could

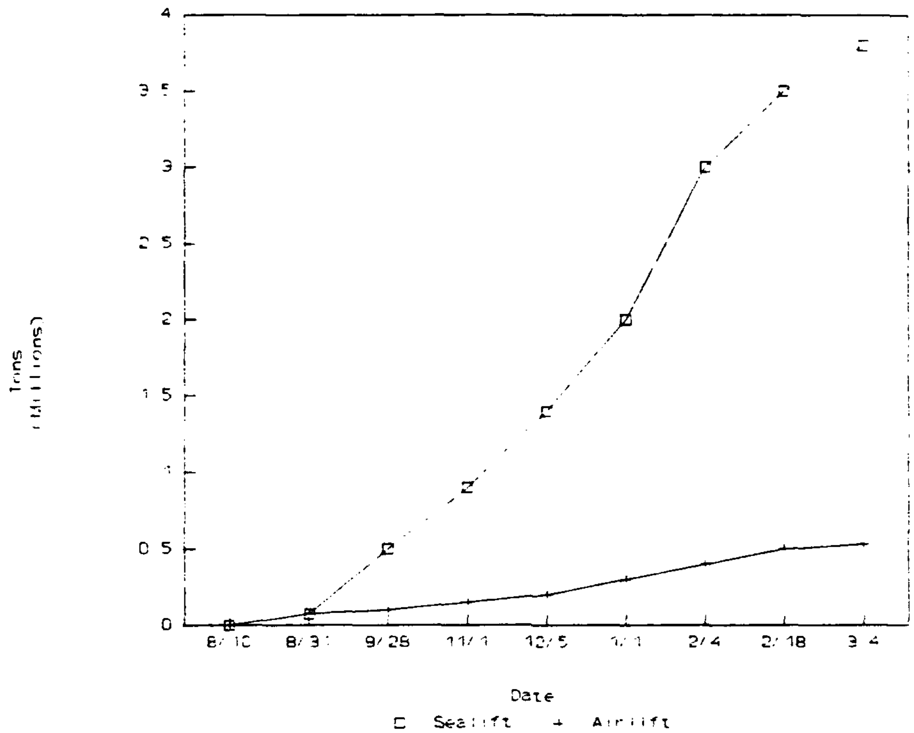


Figure 5 Dry Cargo Lift during Desert Shield/Desert Storm
Source: Operation Desert Shield/Desert Storm
Mitre Corporation

have been spent more productively. (American President Lines, 1991) Additionally, while the carriers were preparing the petitions and waiting for approval, foreign carriers were chartered because of a lack of available shipping.

By March 1991, approximately 37,000 FEU's had been shipped to Southwest Asia under the SMESA since the beginning of Desert Shield. MTMC reported that 30,000 of that total were eventually redeployed to homeports, unopened. MTMC also reported [Priber, MTMCHQ, Interview, May 1992] the top three commodities shipped in containers to have been (in order):

- Defense Logistic Agency (DLA) shipped foodstuffs (50 percent of total)
- Army/Air Force Exchange System (AAFES) material
- Army Depot material

During the initial surge period in Phases I and II, a large majority of unit equipment that could have been containerized was loaded into unit vehicles and transported in that manner. Additionally, many vehicles were lifted with full combat loads because of the fear of having to fight virtually from the time they were debarked in Saudi Arabia. This extra weight was not a major problem from the sealift point of view. Load planning had been done, in large part, based on less than fully weighted vehicles. When vehicles arrived fully loaded the load plans had to be quickly changed. Combat loaded vehicles may become the future norm, especially in light of declining future sealift capacity. Fully loaded vehicles would save time in the early, vital stages of a contingency.

As the statement of Saunders in the introduction of this thesis suggested, the Army's own supply of containers was, in fact, soon depleted. This necessitated the procurement of commercial containers. Many of the Transportation Officers interviewed stated once their containers were used, there was a period where commercial containers were procured from every source possible, in whatever size was available.

Because units normally operated with relatively small numbers of containers, the quantity of Material Handling Equipment (MHE), such as chassis and tractors, was also correspondingly small. During the period of rapid deployment when additional containers were urgently required and procured, the lack of MHE became a problem. As an example, the Transportation Officer for the 82nd Airborne stated his unit normally had six to seven chassis to handle the normal contingent of forty containers. The containers fleet soon increased to over 200, yet the quantity of MHE remained unchanged. (Fredo, Interview, May 1992) This restricted the ability of the unit to handle containers and slowed rather than speeded their use.

The problem of insufficient MHE was also experienced on the discharge end in Southwest Asia. The port facilities in Saudi Arabia were state of the art and containers were discharged quite efficiently from the commercial vessels,however the same lack of MHE caused bottlenecks to occur. The MHE problem was further exacerbated because Combat Supply Support (CSS) equipment that would have been available to move the containers was too low a priority on the TPFDD and "higher priority" equipment moved ahead of it. The lack of chassis, tractors and drivers would become acute, and the immediate port areas experienced heavy buildups of containers. Because both the military and the commercial carriers had significant requirements for MHE and drivers, the two ultimately competed with each other for these critical resources, thereby driving

up the contract cost for both parties. (American President Lines, p. 5 Statement, May 1991)

Another significant problem faced was the identification of container contents. During Desert Shield and Desert Storm, many containers were manifested as "N.O.S" (Not Otherwise Specified) or "Food". (American President Lines, White Paper, May, 1991) Documentation did not keep pace with the containers. Most containers arrived in theater ahead of the documentation. (Lennon, MTMC-TEA, Interview, July 1992) This caused additional bottlenecks until containers could be opened to determine contents and destination. This problem ultimately caused an "operational failure" at the port of Dammam. The port was closed for eleven days to open containers in order to determine disposition. This occurrence highlights the effectiveness of the commercial container industry's delivery system and the hurdles the military would face incorporating containers as a regular component of deployment.

III. UNIT INTEGRITY

A. CONCEPT

Army Regulation AR-56-4 states:

> Maintain unit integrity by keeping a unit's equipment in the same container or the same ship.

Unit integrity is the basic desire of commanders to keep elements of their units in close proximity to each other during deployment so those elements may be quickly reconstituted into an battle-ready fighting force, with a minimum of disruption or loss of effectiveness. Unit integrity is a quite necessary, valid and crucial element in deployment of military units.

The ability to rapidly reconstitute contingency forces is critical to the success or failure of a mission. The inability to rapidly reconstitute forces can cause delays in battle readiness and allow for a degradation or loss of military momentum or advantage. A problem arises, however, because each unit commander envisions unit integrity differently. Consequently, the requirements for maintaining unit integrity will also differ from unit to unit.

B. UNIT COMMANDER CONCERNS

Unit commanders are especially concerned about the ability to have their unit arrive at the Port of Debarkation (POD)

relatively intact. They are also extremely concerned with in-transit visibility of their equipment. Breaking units apart into several elements and the resultant loss of control, coupled with poor visibility of these shipment elements, is naturally stressful to the commander. Acting upon these concerns, unit commanders may pressure transportation providers to tailor the deployment around the unit, in order to ensure it arrives intact and before other units. However, this intervention can result in the suboptimization of available lift capacity.

Suboptimization can take the form of a reluctance to containerize equipment in order to avoid the dispersion and subsequent loss of control. This can lead to vehicles being heavier than planned, which could cause load plans to be changed to lower the number of vehicles carried because of the increased weight. Suboptimization can also precipitate requests for units to be transported on specific vessels. Not matching the cargo with the best vessel can cause the vessel to sail with unused capacity. Both lend themselves to the inefficient usage of square footage on available bottoms and should be avoided, although the incentive is strong to suboptimize in order to maintain "unit integrity."

The fullest optimization of RRF resources will be critical to the success of "the smaller, CONUS-based force, called the Contingency Corps, which will consist of only five divisions." (Sowers, quoting General Vuono, Army Chief of Staff, statement

to Congress, March 1991) Reduction in forces will in turn cause sealift assets to decline. Rapid deployment forces used Roll-On/Roll-Off (RORO) vessels heavily during Operation Desert Shield/Desert Storm, but these vessels are being replaced by containerships in commercial industry and will not be available in the future in significant quantities (Tippett, MSC, Interview, Jul 1992). Unit commanders must become familiar with the capabilities and restrictions of the RRF and on the need to fully capitalize on the RRF's and the container industry's capacity to move material on strategic missions.

C. PERCENT OF EQUIPMENT CONTAINERIZABLE

Units are divided into three basic groupings:

- Combat (CU) - Infantry, Armor, Artillery
- Combat Support (CS) - Intelligence, Communication, Military Police
- Combat Service Support (CSS) - Quartermaster, Transportation, Maintenance

Unit equipment comes in various sizes and configurations. Some of it easily lends itself to containerization while some of it does not. Combat units normally have low percentages of containerizable equipment, while Combat Service Support units have much higher percentages.

While Combat units are envisioned as having low percentages of containerizable equipment, significant gains can be made in the optimization of shipping bottoms if containers are used by all unit groupings. For example, an Infantry battalion

with the minimum amount of material containerized requires 1,110,010 square feet of shipping space. With the maximum amount of material containerized, the space required shrinks to 786,000 square feet. (Trosclair, JCS, Interview, Jan 1993)

As seen in Table 5 (Sower, 1991), considerable gains can be made when utilizing container technology in deployments even for Combat units. Containers can add to unit integrity through the reduction in square footage required, however units must be equipped to be able to handle containers if the benefits of container technology are to be gained. The ability to handle containers and quickly assemble into a fighting unit will be critical.

Table 5 PERCENT OF ARMY DIVISIONS DEPLOYABLE BY CONTAINERSHIP

	Unmodified				**Modified**
	Containers		**Flatracks**		
Type Division	20 Ft	40 Ft	Comm*	H.D.#	**Seasheds**
Air Assault	31	38	87	94	91
Airborne	39	49	93	97	96
Air Calvary	18	19	64	95	91
Armored (RC-NG)	8	8	50	98	94
Light Infantry	40	48	91	97	97
Infantry (Mechanized)	9	9	51	99	97

* Commercial - 8 feet high and 26-40 long tons
\# Heavy Duty - 13 feet high and 60 long tons
Source: MTMCTEA Study OA 88-5c-18, Analysis of Containerization on Unit Strategic Deployment (As of November 1988)

D. UNIT INTEGRITY ISSUES DURING DESERT SHIELD AND DESERT STORM

USTRANSCOM reported (Zak, Interview, May 1992) the four major transportation problems of Desert Storm to be:

(1) Unit Equipment

(2) Loss of Control

(3) Missing Equipment

(4) Lack of Faith in the "System"

Unit commanders realized early in the conflict they faced the possibility of having to fight coming directly off sealift vessels. They naturally wanted to have that capability. Breaking units into different elements to allow for transport would endanger that ability in the eyes of some. Some commanders did not trust "the system" to deliver their material, when required, or on time. This created incentive for unit commanders to intervene in the transportation process. The type of intervention described in Section B above was experienced by Installation and Unit Transportation Officers and Military Sealift Command.

Unit integrity was a concern to transportation commands as well. Incidents of operational commands directing transportation commands how to move units did occur. This intervention is as frustrating to the transportation commands as it is to the unit commander. As stated by Mr. Burns of MSC, London to Sowers, "Does the Army want the transportation services, or do they want the ship?" (Sowers, 1991) While specific ship

types may be ideal for certain units, intervention could have unfavorable effects on future surge movements because of the anticipated decline in capacity.

While many commanders felt that unit integrity was at risk during the overseas lift segment of their deployment, problems were experienced in CONUS prior to leaving. The rapid loading of materials without complete documentation caused those materials to lose visibility. As Reserve units were activated and reported for service, some were used in their support capacity to load containers - something they had not had any significant experience doing. (Fredo, 82nd Airborne, Interview, May 1992) Their effort was Herculean, but because this type of deployment had not been regularly drilled, its hurried nature lent to material visibility problems.

Movement from the unit's home base to the Port of Embarkation (POE) also contributed to the degradation of unit integrity. Railroads played a critical role in getting units to the POE. Because of the very short nature of the crisis, railroads did not have sufficient capacity to handle the initial surge. (Jordon, 24th Infantry, Interview, May 1992) This necessitated rapid augmentation by truck. If items were "roadable," they went by truck to the POE to join the heavier equipment coming in by rail. When this factor is combined with: (1) obtaining containers from whatever source could supply them, (2) lack of material handling equipment and (3)

less than full documentation of contents, unit integrity was degraded in most cases before it ever arrived at the POE.

E. CONTAINERS AND SURGE DEPLOYMENTS

1. Strategic and Unit-Owned Containers

Containers are classified into one of two categories, as either "strategic" or "unit-owned." Strategic containers are "permanent" containers used to transport material and are then "recycled" into the transportation "system" container fleet. These containers are viewed simply as "platforms" for the movement of material. "System" containers could be commercially leased or Government-owned. Unit-owned containers are containers that remain with a unit throughout the employment of that unit. The container deploys with the unit, is transported with the unit on the mission, and is then redeployed with the unit at the end of the mission. (Sowers, 1991)

Each class of container fills a recognized niche. Strategic containers are well suited for the sustainment role. Unit containers are better suited for the surge role. As evidenced by the use of CONEX boxes during the Korean and Vietnam conflicts, unit-owned containers can significantly add to the operational flexibility of a unit, because they are readily at hand when the deployment order is received and can double as temporary storage facilities.

2. Container Mission

The specific mission for containers during surge deployments is still being debated. The need for rapid force reconstitution at the POD is recognized and critical. Because of this debate and the strategic necessity of quickly marshalling forces, the exact nature of the employment of containers remains uncertain. What is clear at this point is that containers will be needed quickly during this phase.

As evidenced by the amount of time required to bring container service on line during Desert Shield, units will have to maintain inventories of containers in order to be able to respond to crisis situations. A significant hurdle faced by planners is deciding if support and reinforcement should occur earlier or later in the deployment process. In all likelihood, forces will have to take large supplies of material with them in the initial surge. Containers will have a critical role, thereby making containerization a critical element of the surge deployement. To further complicate surge deployments, the size and availability of future containership assets is a major concern.

The use of containers, seasheds and flatracks is becoming increasingly recognized as a way to increase the amount of unit equipment able to be transported on containerships or vessels equipped to carry containers in addition to other cargo. For equipment to be deployed by container or equivalent, it must first be classified as containerizable.

The effect of classifying equipment as not containerizable because of unit integrity concerns when, in fact, the equipment actually is containerizable, restricts both the type of vessel the equipment is able to be transported on and the degrees of freedom for the transportation providers, and may, ironically, reduce unit integrity.

IV. CONTAINER POLICY, SUPPLY AND AVAILABILITY

Whether or not commercial containers are applicable for military use during surge deployments is an important question. An equally important question is how best to maintain access to containers during those periods. Options include purchasing containers, rental/lease type arrangements or some combination of the two.

This chapter examines current DoD and Army container policy and the availability and supply of containers and how it relates to surge deployments. The chapter also examines these areas from a commercial carrier perspective in order to provide a more complete picture.

A. POLICY

1. Department of Defense Directives

There are a number of directives regarding DoD container policy. Each Service tailors its container policy to its specific situation. This thesis utilized two directives. The first was Department of Defense Instruction 4500.37, Management of the DoD Intermodal Container System, dated 2 April 1987. It pertained to overall DoD container policy. The second was Army Regulation 56-4, Management of Army Intermodal Container System, effective 1 October 1990, more common-

ly known as AR-56-4. It pertained to the Army's container policy. The focus on these two directives is based on the assumption that the Navy and Air Force are self-sustaining and that the Army is the major consumer of containers.

Army Regulation 56-4 promulgates "policies and command responsibilities for the use of intermodal assets to optimize the use of strategic sealift and improve force closure time, that is, the time to move the force to the port of debarkation (POD)" (Army Regulation 56-4, Management of Army Intermodal Container Systems, p. 1, 1 Oct 1990) It directs the Army's containerization efforts be guided by the following principles:

> a. Optimize the containerization of Army unit equipment (UE) to reduce force closure time, to meet the needs of the supported theater commander-in-chief, and to reduce transportation costs.
>
> b. The 20 foot long by 8½ foot high by 8 foot wide ANSI and ISO container is the primary size container for unit equipment shipments. Larger containers may be used in contingency or mobilization operations. However, user capability to handle and transport these containers shall be the overriding consideration; for example, what is the availability or capacity of container-handling equipment?
>
> c. Stuff (load) Army UE in containers at origin or nearest containerization consolidation point.
>
> d. Stuff all sustainment items (resupply) at origin, for example, depot, contractor facility, or containerization consolidation point.
>
> e. Design Army transportation infrastructure and assets to supplement commercial container transportation capability and ensure origin-to-destination handling ability.
>
> f. Achieve rapid and forward container unstuffing (unloading) and the return (retrograde) of containers.

g. Develop doctrine and train for containerization at all levels.

h. Maintain ANSI/ISO container standards to ensure compatibility with the commercial intermodal transportation system.

i. Containers and associated equipment may be procured or leased under conditions established in DoD Directive 4500-.37.

j. Use containers in peacetime to train for transition to war, to meet mission requirements, and to reduce transportation costs.

DoD Instruction 4500.37 states:

1. DoD Components attain and maintain a container-oriented distribution system of sufficient capability to meet DoD-established mobilization and deployment goals while ensuring commonality and interchangeability of intermodal containers, hardware, and equipment between the Military Services and commercial industry, which collectively constitute the DoD container-oriented distribution system. The container-oriented distribution system must interface with and complement the movement and control of all other noncontainerized DoD cargo.

2. DoD policy is to rely on the use of intermodal container resources and services furnished by the commercial transportation industry when doing so is responsive to military requirements.

3. Containerized shipment shall be the preferred method, unless cost effectiveness or peculiar shipment requirements are an overriding factor. (DoD Instruction 4500.37, Management of the DoD Intermodal Container System, 2 April 1987)

DoD Instruction 4500.37 directs that each Military Service prepare plans "for containerization actions" they have or will be assigned. Table 6 summarizes container programs and responsible DoD components assigned by DoD Instruction 4500.37. Each of the Services is responsible "for the funding of assigned programs" and is required to update their contain-

Table 6 PLANNING RESPONSIBILITY

PROGRAM TITLE	RESPONSIBLE DoD COMPONENT
Air Movement Plan	Department of Air Force
Containerized Ammunition Distribution Plan (CAD)	Department of Army
Seashed Program Management Plan	Department of Navy
Offshore Discharge of Containers/Logistics over the Shore (OSDOC/LOTS) Program Management Plan	Department of Army and Navy
Container Systems Hardware Status Report	Department of Army
Container Requirements and Availability Study	Department of Army

Source: Department of Defense Instruction 4500.37 dated April 2, 1987, enclosure (4).

erization plans annually as of 31 December. Specific program updates and briefings must be provided annually to the Director of Transportation Policy, OUSD(A) and members of the Defense Transportation Policy Committee.

2. Industry Perspective

The NSIA/NDTA Strategic Mobility Conference late last year concluded "the recently published DoD container intermodal policy has triggered a number of questions from industry" which include:

- Inadequate 20 foot TEU inventory
- Inability to locate container assets
- No mobilization plan in or outside of CONUS for containers

- Lack of chassis and related support equipment. (Richard Lidinsky, Statement to House Commission on Merchant Marine and Defense, May 1988)

Each of these potential trouble areas were experienced by the Department of Defense during Operation Desert Shield. The experiences of the British armed forces were also similar during the Falklands campaign with regard to their use of containers and containerships.

All container companies contacted by this author echoed the need to streamline the contracting process so that in times of a national emergency container usage may be brought on line immediately. "In time of national emergency, strategic sealift materials must not await issuance, amendment, submissions, and awards under a 73-page long container equipment lease process" (Lidinsky, May 1988). In May 1991, the Vice President for Government Affairs, American President Lines (APL), testified before Congress and spoke of the need for the government:

- To improve the peacetime procurement of ocean shipping services in order to truly support integrated intermodal networks.

- To establish wartime procurement contingency plans in order to make immediate use of commercial intermodal networks.

- To work with industry to maximize use of the liner sector during all phases of national emergencies (Michael Murphy, Testimony to House Committee on Merchant Marine and Fisheries, May 1991).

B. CONTAINER SUPPLY

> A review of all current military container oriented literature indicates conflicting roles for the container. One debate will focus on whether containers should be used at all in strategic sealift efforts, while other commentators are concerned about the containers most appropriate to our sealift efforts--yet all commentators never address the more basic question of adequate container supply. (Richard Lidinsky, Statement of Sea Containers of America, Inc to the Commission on Merchant Marine and Defense, May 24, 1988)

The statement of Mr. Lidinsky summarized the current container debate rather succinctly. Previous chapters of this thesis discussed problems with container usage and unit integrity, and the strong incentives not to containerize surge forces. The concept of container usage has generally been accepted, especially with regards to ammunition, however the supply and availability of containers needs to examined.

Mr. Lidinsky further stated:

> At least in budgetary terms, strategic sealift containers seem to refer to seasheds and flatracks. Our company has opposed the construction and development of seasheds, believing they fail to meet the key criteria in sealift mobilization scenarios--rapid and reasonable production, trouble free storage, useable on all vessels, and easily transported from and returned to our shores.

Mr. Lidinsky's sentiments was substantiated by Sowers (Sowers, p. 35, 1991):

> Unfortunately, even after the development, procurement, and strategic national placement of the 1,500 SEASHEDs and 3,500 FLATRACKs (at a cost of 40 million dollars) not a single containership was modified with this equipment in order to deploy outsized unit equipment during Desert Shield! The biggest reason for not using commercial containerships was the fact that the military could not afford to take the time to modify the ships after mobilization began... Once the crisis had developed, however, ship

repair facilities were unavailable to perform the required modifications in the time that could be allowed.

DoD Instruction 4500.37 is quite clear that the majority of containers will come from the commercial sector, unless military needs dictate otherwise. This policy is in line with the Jones Act of utilizing the Merchant Marine to carry DoD cargo. But relying on the commercial sector to pick up surge and sustainment container movements may be "false reliance on the private sector for container stockpiles that do not exist." For example, Sea Containers America, Inc. calculated on a specific day it had less than 350 flatracks available to lease to DoD out of a total flatrack inventory of 20,500. (Richard Lidinsky, Statement to House Commission on Merchant Marine and Defense, May 1988)

It has been accepted that DoD will have to maintain an inventory of containers for immediate access in a contingency, but relying heavily on the commercial sector to quickly and readily pick up the slack may not be realistic. To make reasonable decisions, military planners must have some sort of visibility of the commercial market and not assume industry will be available to assist immediately. Some in the commercial sector have advocated military visibility of commercial assets through a reporting system for containers, or for DoD to have a right of "first call" on container assets.

The extent to which DoD may rely on the commercial sector was noted by Richard Lidinsky in his statement to the Commis-

sion on Merchant Marine and Defense when he quoted a revealing comment made by Maryland Congresswoman Helen D. Bently in 1987 when she said, "The Pentagon estimates a 125,000 cargo container need, but has less than 15,000 containers." The DoD container inventory has increased in the intervening years, but a large number of containers were obtained during Desert Storm through the incurring of detention and demurrage charges (CDR Brown, MTMCHQ, Interview, Jul 1992), which made their purchase the least cost method of paying the owners. Additionally, 10,000 commercial twenty foot containers were specifically purchased for Southwest Asia ammunition retrograde (HQDA Washington D.C. Army Message, Subject: Management and Disposition of Newly Procured Commercial Containers, 171800Z Jul 91). Even with these additional containers, the need will still be large.

Michael Murphy of American President Lines noted in his testimony in May 1991 before the House Committee on Merchant Marine and Fisheries that:

> The United States had to use <u>all</u> of its 25 afloat prepositioned vessels. <u>All</u> of its 8 fast sealift ships. The U.S. also had to break out, activate and find crews to man 71 Ready Reserve Fleet vessels...Finally, the military had to use up to one-third of the capacity of American U.S. flag containership operators...Even with <u>all</u> of these resources, the U.S. still needed to charter foreign-flag vessels. (Michael Murphy, <u>U.S. Capability to Meet Future Sealift Requirements</u>, Statement to the House Committee on Merchant Marine & Fisheries, May 1991)

In supporting DoD contingency operations, transportation carriers, especially ocean liner firms, may encounter finan-

cial hurdles that could hinder their ability to conduct commercial operations as they had done prior to the contingency. They may unintentionally be required to financially support DoD operations for periods of time until they are reimbursed. The sums will not be small. The money required to sustain DoD operations is substantial and companies may not be financially able to conduct those operations and simultaneously continue their commercial requirements if they are not paid promptly for their services. They would, in effect, be loaning the government money. American President Lines' experience during Desert Shield/Storm is a good example of the burden that may be placed on carriers. Mr. Murphy stated that APL "was able to sustain financially the effort where, at one point, we had advanced over $23 million on the government's behalf."

C. CONTAINER AVAILABILITY

At present, the worldwide container inventory is approximately 7,300,000 TEU's. Twenty foot and forty foot containers complying with ISO standards make up 97.5 percent of the total (Porter, Journal of Commerce Staff, Dec 21, 1992). In 1987, the average age of a "standard box" was reported to be 10 years, with "many as old as 12 or 14 years" (Martin, Lease vs. Buy: The Container Option, Container News, June 1989). The 1987 average remains approximately the current average age. Mr. George Saunders of Military Sealift Command (MSC) reports the average life of a container to be approximately

thirty years, but that they may still be useful for periods of up to five years past that point in time. FORSCOM reported "experience with MILVANS indicates a 15 to 20 year expected life" and they would "be replaced only as required." (Draft FORSCOM Container Action Plan, 1992) In the last several years, leasing companies have increased their inventories 30 percent while the shipping companies have increased their inventories by 20 percent. (George Saunders, MSC HQ, Telephone conversation, February 1993)

The general availability of containers does not appear to be a problem. Rather, it is the timeliness of the availability that is of concern. Mr. Saunders stated that the supply of containers was much like the supply of automobiles in the United States - exceptionally large. No shortage of containers is envisioned; however, the commercial container utilization rate is a significant factor in the availability of containers for DoD use in a contingency. Equipment utilization rates of 94 to 96 percent in the commercial sector have been common in recent years (Martin, Lease vs. Buy: The Container Option, Container News, June 1989). The Special Mideast Service Agreement (SMESA) containers were all unused capacity of the commercial market because of a downturn in the shipping market. Had the market been operating at the high utilization percentages, the container picture could have much different for Desert Shield and Storm.

As evidenced by the experiences of the early deployers in the first stages of mobilization in support of Desert Shield, there was substantial demand for containers as units' container inventories were rapidly exhausted. They quickly turned to commercial carriers to help with the excess. These requests took time to complete and many units were actually competing with each other to buy or lease the very same containers, thereby driving up the price (Lennon, MTMC-TEA, Interview, Mar 1993). After inspection, a portion of the containers received were judged to be in poor material condition (Interviews with Transportation Officers of the 24th Infantry, 101st Airborne and 82nd Airborne). Only 50 percent of the containers slated to be used for ammunition could pass the International Maritime Dangerous Goods (IMDG) code inspection (*Lennon*, MTMC-TEA, Interview, Mar 1993). The time required by the carrier to gather the needed containers could explain the initial delay in response and poor condition of the immediately available containers because the containers in the best condition would be in service, while those in poorer condition are held back, however it does appear in a few instances that containers in poor condition were "unloaded" on DoD. In response to this type of problem, the Department of the Army is in the process of drafting the Container Inspection Handbook, MIL-HDBK 138A (AR) and a memorandum on Container Repair Guidelines.

1. Lease Versus Buy

In 1987, the Institute of International Container Lessors prepared an industry white paper to study the lease versus buy decision carriers face in order to better understand the process (The Lease-versus-Buy Decision for Container Equipment, Temple, Barker & Sloane, Inc, Sep 1987). While the study was commissioned for the commercial sector, many of its facets hold true for the military transportation planner. Despite the passage of time, the report still has valuable insights into the decision making process.

The study by Temple, Barker & Sloane, Inc. examined the advantages and disadvantages of leasing. Figure 6 summarizes the responses given in interviews conducted with major worldwide shipping lines. The study was conducted in order to ascertain attitudes about and the basis for the lease versus buy decision.

Far and away the biggest perceived advantage to leasing was the flexibility it brought in meeting equipment requirements. Minimization of the risk of not having sufficient equipment to handle demand was key. In keeping with the desire for flexibility, the carriers did not conduct business with only a handful of lessors, but rather across a number of companies, normally between five and twelve. (The Lease-versus-Buy Decision for Container Equipment, Temple, Barker & Sloane, Inc, p. 3, Sep 1987)

Perceived Advantages of Leasing	Percent of Responses
Flexibility in equipment availability	82
Buffer stock for market growth and demand surges	44
Defer capital spending	38
Offset flow imbalances	31
Minimize inland repositioning	25
Hedge risks in market growth and new types of equipment	25
Cheaper than repositioning empty containers	25
Avoid in-house administration cost for container management	19
Facilitate interchange with other lines (particularly when box moves out of carrier's area of control)	7

Perceived Limitations of Leasing	Percent of Responses
Leasing thought more expensive than owning	38
Lessor thought not always able to position inland more efficiently than carrier	19
Lessor does not always have equipment in position to meet short-term demand surges	19
Lessor cannot always reposition containers on unbalanced trades more efficiently than carrier	19

Source: The Lease-versus-Buy Decision for Container Equipment, Temple, Barker & Sloane, Inc. September 1987

Figure 6 Carrier's Perspective on Container Leasing

Many carriers maintain pools of containers to handle the constant portion of their business and then lease containers for surge or unusual periods of demand. This enables carriers to have sizable portions of their equipment pool owned and maintained by lessors, thereby freeing capital assets and deferring spending on such equipment. Costs associated with obtaining and maintaining associated ancillary container handling equipment and the administrative cost of

overseeing and maintaining a container pool are also avoided. (The Lease-versus-Buy Decision for Container Equipment, Temple, Barker & Sloane, Inc, p. 4, Sep 1987)

The advantages gained by leasing in the commercial sector have many parallels in the Department of Defense. DoD can be extremely flexible with the size of its container inventory, yet it must take note of the relationships maintained by commercial carriers with a large number of lessors. Lessors know their customer's needs and the lessee knows what the lessor holds in assets. The costs of owning and maintaining a huge container "buffer" fleet, that may be unused for significant periods of time, could be tremendous. Leasing offers the ability to avoid acquiring those containers and the supporting infrastructure.

There are certainly costs associated with leasing equipment. Questions of an overdependence on leased containers were raised in the study. A large reliance on leased containers could cripple a carrier or DoD in the early stages of increased demand, or a surge associated with a contingency, until the containers could be delivered.

Many of the executives interviewed expressed views that leasing expenses were actually higher than ownership when costs associated with picking up and delivering the containers and per diem charges were included. There were also "hidden" costs. Instead of having administrative costs of maintaining a container pool, there are administrative costs of maintain-

ing a container rental negotiating and financing staff, having representatives at the manufacturer's plant to supervise compliance with ISO and specific military requirements, damage, and costs of repositioning. Each of these costs must be factored into the lease versus buy decision. (The Lease-versus-Buy Decision for Container Equipment, Temple, Barker & Sloane, Inc, p. 4, Sep 1987)

2. Alternative to Lease Versus Buy

USTRANSCOM is in the process of drafting a concept known as the "Contingency Intermodal Contracts for Unit Movements." The basic philosophy of the plan is:

> to work with the Army (and possibly USAF) to identify CS/CSS units suitable for intermodal movement, develop contracts, and have industry bid on contracts for specific units. Industry would then plan directly with unit commanders to be able to accomplish mission. (Gary Adams, USTRANSCOM Memorandum to MTMC, 2 Jun 1992)

After suitable units had been identified for movement on board containerships by FORSCOM, contingency contracts could then be put in place. These contracts would address areas such as the following:

- CONUS to OCONUS areas for movements (broad or specific).
- Cargo requirements of the unit. Door to Door service. Origin outload, movement to SPOE, vessel onload, movement to SPOD, vessel discharge, onward movement.
- Data and documentation standards. Interface requirements between commercial system and DoD. Reporting requirements throughout the transportation pipeline.
- Planning and exercise responsibilities for both government and contractor.

- Timeliness for deployment/execution at origin. Transit time allowed to SPOD. In-theater delivery responsibilities.

- Set rates.

- Companies work directly with Unit Commanders at the Unit's installation during peacetime to develop movement plans. Readiness and movement planning could be tested using field exercises.

- U.S. companies or U.S./Foreign consortium or cooperative ventures would be allowed to bid. Any routes that received no U.S. company bid would be open to foreign flag companies.

- Allows industry to plan with DoD in peacetime. Allows industry to know what movement requirements are. Removes forces from deployment shipping during contingencies and frees up RO/RO space for Combat units. (Gary Adams, USTRANSCOM Memo to MTMC, 2 Jun 1992)

This proposal is still in the conceptual stage, with many questions yet to be answered. MTMC has concerns regarding:

- Ability to stuff/unstuff containers

- Lack of facilities

- Drayage requirements to SPOE and responsibility thereof and possible conflicts with combat units for same assets

- Units' proximity to unimproved ports and subsequent effects

- Tracking systems, i.e., use carrier system or Joint Container Control Office (JCCO) system and interface compatibility requirements, especially with regards to the Worldwide Port System (WPS)

- Definition of in-theater ground transportation resources and responsibilities

- Effect of hostile environment on carrier and rates

- Will ammunition be allowed through commercial ports?

- Political considerations of using foreign carriers from both the U.S. and foreign country perspectives (Levine, MTMC-HQ, Interview, June 1992)

D. SUMMARY

The Department of Defense has recognized the need to adapt its shipping operations in order to access the commercial container shipping industry. Containers have been declared to be the preferred method of shipment. DoD directs containers be utilized in order to reduced closure times. Reliance on the commercial sector will be heavy, but as seen in Desert Shield/Storm, the commercial capability is in place to respond to the demand.

The commercial container market operates roughly in equilibrium. While some carriers are increasing their fleets of containers, others are reducing theirs. Individual companies are small when compared to the entire market. When a contingency arises and DoD seeks vast numbers of containers, the market could easily shift to a "seller's market," where demand significantly exceeds the available supply. This drives up the costs of containers, whether purchased or leased. The industry might not be able to respond immediately to the surge in demand, and it may take some time to marshall the desired containers, which further drives up prices.

Both ownership and leasing have significant advantages and disadvantages. Both have obvious and hidden costs. A large

percentage of owned containers allows an independence in response to both crisis and normal situations. This would come at great expense due to the purchase and maintenance of inventory and related infrastructure and does not appear to be a financially viable alternative.

Leasing, on the other hand, allows flexibility in reduced inventories, infrastructure and capital expenditures, however it creates a dependency on the lessor and reduces response flexibility and options. The most appropriate approach may be like that of the commercial side - maintaining a base pool for the steady requirements and the leasing of containers for surge requirements.

Rapid mobilization plans for container assets and peace-time visibility of those assets will be crucial to the success of containerization of unit equipment. Contingency plans for no-hassle contracting with commercial carriers must be put in place. Visibility of container assets available from carriers and of containers in transit is also critical to successful incorporation of containers into surge deployments.

V. CONTAINERS

Containers and the unitization of material have been tremendously successful in the commercial world. This success is due in part to the development of containers with a limited number of compatible footprint sizes which are nevertheless tailored for the shipment of commodities with a wide range of distinguishing characteristics. For example, commercial containers with 40 foot × 8 foot and 20 foot × 8 foot footprints include standard boxes, refrigerated boxes, open top boxes, hatch top dry bulk containers with gravity discharge, tank containers and flatracks. To help deal with different commodity densities, the standard box containers also vary in height from 8 to 9½ feet. Furthermore, two 20 foot long units can often be treated as a single 40 foot unit during movement. This specialization within an overall standardized approach has enabled commercial container carriers to efficiently meet the service needs for a large range of shippers.

The variety of containers in service in commercial markets has a counterpart in the Department of Defense. The goal of DoD is to have ready access to the commercial market without the need for modifications to equipment, however, DoD has many requirements that would not fully utilize a full-sized container. Additionally, there is a need for small, highly

mobile command-type units that can be transported and set up very quickly.

A. DoD INVENTORY

The DoD inventory has a wide variety of containers and capacities that meet its military specifications (MILSPECS). The following containers are currently in the inventory (1992 Container System Hardware Status Report):

- MILVAN (Ammunition Restraint)
- MILVAN (General Cargo)
- 20 foot ISO End Opening
- 20 foot ISO Side-Opening
- Refrigerated
- 20 foot Half-Height
- ISO Tactical Shelter
- Mobile Facility
- TRICON - Shipping/Storage (Bulk and Configured)
- EDSS Quadruple Container (QUADCON)
- Palletized Load System (PLS) Logistics
- 20 foot Flatrack
- 40 foot Heavy Duty Flatrack
- Load and Roll Pallet (LRP)

In addition to the MILSPEC containers sited above, Military Traffic Management Command (MTMC) has requested National Stock Numbers (NSN) and Standard Line Item Numbers (LIN) for

the following non-MILSPEC containers (Gore, MTMCHQ, Memo, Dec 1991):

- End opening 8 foot x 8 foot x 20 foot dry cargo
- End opening 8 foot x 8½ foot x 20 foot dry cargo
- Side opening 8 foot x 8 foot x 20 foot
- Half-height 8 foot x 4¼ feet x 20 foot
- Load and Roll Pallet
- Flatracks

The following is a description of the MILSPEC container types identified in the 1992 Container System Hardware Status Report:

MILVAN (Ammunition Restraint) - ANSI/ISO container equipped with restraint hardware capable of handling approximately *20 long tons* of ammunition. See Figure 7.

MILVAN (General Cargo) - ANSI/ISO container capable of handling up to 20 long tons of general cargo. It is used mainly to transport and temporarily store military cargo. See Figure 8.

20 Foot ISO End Opening - used to transport ammunition. It is capable of being transported by commercial or military means. The door end corner posts have been modified with angle iron to enhance blocking and bracing required for ammunition. There is no permanent restraint system as in the Ammunition Restraint MILVAN. See Figure 9.

20 Foot Side-Opening - ISO container with two double doors located on one side of the container which open fully to allow

complete, unobstructed access to the contents. It is equipped with internal tie-down rings to secure cargo. It can be transported by both commercial and military means. See Figure 10.

Refrigerated - transports, temporarily stores, and assists in the distribution of temperature-sensitive cargo. It is a commercial design modified to military specifications. It conforms to ISO requirements. See Figure 11.

20 Foot Half-Height - 20 feet X 8 feet X 4.25 feet. The half-height has fixed sides, open top, and one drop-end to allow access to contents. The containers come with bows and tarpaulins to use as covers during transit and storage. Used primarily for drummed oils, lubricants and ammunition. See Figure 12.

ISO Tactical Shelter - a presized, transportable structure designed for live-in, work-in, or container capability. It comes in expandable or non-expandable versions. Expandable shelters come in one or two-sided expandable models. All shelters are available in 60 and 100 amp versions. See Figure 13.

Mobile Facility - rigid walled ISO container used primarily to house aviation weapons systems maintenance, tactical operation, logistical, and administrative functions. These containers come in several configurations. Used primarily by the Navy and Marine Corps, but also by other services. See Figure 14.

TRICON - all steel construction with standard ISO corner fittings with 3-way forklift access. It comes as a bulk carrier or configured with cabinets and shelves. Three of these containers coupled together form a nominal 20 foot module. See Figure 15.

EDSS QUADCONS - consists of two types of containers; one suitable for air transportation and the other by ground/ocean transportation. The ground container will be fully ISO compatible. It will have doors on both ends to allow for full access to the contents, even when joined together. Four containers will be capable of being joined together to form a 20 foot equivalent ISO container. See Figure 16 and 17. Procurement is slated to begin in Fiscal Year (FY) 94.

The EDSS QUADCON is a second generation QUADCON. First generation (1984) QUADCONs have ISO corner fittings and, except for height, have the same dimensions as a 20 foot ISO container. First generation QUADCONs are used by the Marine Corps and are part of the "Marine Corps Family of Intermediate Size Containers." The difference between first and second generation QUADCONs is small. Both are 96 inches in length and 82 inches in height. The EDSS QUADCON is 57½ inches wide vice 57.38 for the original QUADCON. Cargo capacity of first generation QUADCONs is 8,200 pounds vice 8,000 pounds for the EDSS QUADCON.

Palletized Load System (PLS) Logistics - The Palletized Load System (PLS) is "the Army's approach to overcome" ammuni-

tion logistics "material handling and transportation shortfalls associated with delivering Class V (ammunition) materials to combat units." The PLS system "consists of a standard mobility heavy duty truck chassis, an integral hydraulic load handling mechanism, a compatible trailer, and a number of flatracks." The truck is self-loading and unloading.

The PLS Logistics concept is intended to demonstrate a direct link between PLS and strategic transportation assets. There are two PLS Logistic concepts: the Hooklift Interface Kit (HIK) and the Enhanced PLS Flatrack (EPF). The HIK enables a PLS truck to directly lift, transport, and deliver any commercial 20 foot container with the assistance of an X-frame and a hook that attaches to a support frame. The EPF is based on a 20 foot flatrack modified with PLS. The EPF resulted in the development of the Ammunition Container (AMCON) and is envisioned to be able to transport ammunition without additional handling between CONUS and the battlefield. See Figure 18, 19 and 20.

20 Foot Flatrack - a 20 foot container with open sides and top to allow easy accessibility to material. Used to transport bulky, high cube type items. See Figure 21.

40 Foot Heavy Duty Flatrack - developed to provide a breakbulk capability to containerships in order to carry heavy and/or outsized cargo. There are two versions: 67.2 short ton and 72 short tons. The flatrack is a steel frame, decked

over and fitted with tiedown points. The corner posts fold down to facilitate stacking and storage. See Figure 22.

Load and Roll Pallet (LRP) - a steel frame platform equipped with rollers. It measures 89 inches wide x 227 inches long x 10 inches high and fits inside a standard 20 foot ANSI/ISO container. It is used to unload a complete load of four Multiple Launch Rocket System (MLRS) Pods or four Army Tactical Missile System (ATACMS) Pods from an end opening container. It essentially unitizes missiles to allow access to the intermodal transport network. See Figure 23.

A potential militarily-useful container, not currently in the inventory, entails a proposed modification of the half-height container by Mr. George Saunders of Military Sealift Command. With this modification, the half-height container can be fitted with an expansion frame to allow it to have "full" dimensions, thereby offering four distinct advantages over other forms of containers: a) it can accommodate high-density (e.g., ammunition, drummed POL) in its unmodified configuration, b) with an expansion frame, it is capable of accommodating irregular and unit-type cargo, c) with a tarpaulin fitted, it can serve as a closed dry cargo container, and d) after devanning, the expansion frame can be removed, secured in the container, and the unit positioned for retrograde movement. (Saunders, Adapting Containers to Military Requirements, 1986) It appears this design offers a range of cargo

accommodation profiles that "standard" containers do not. See Figure 24.

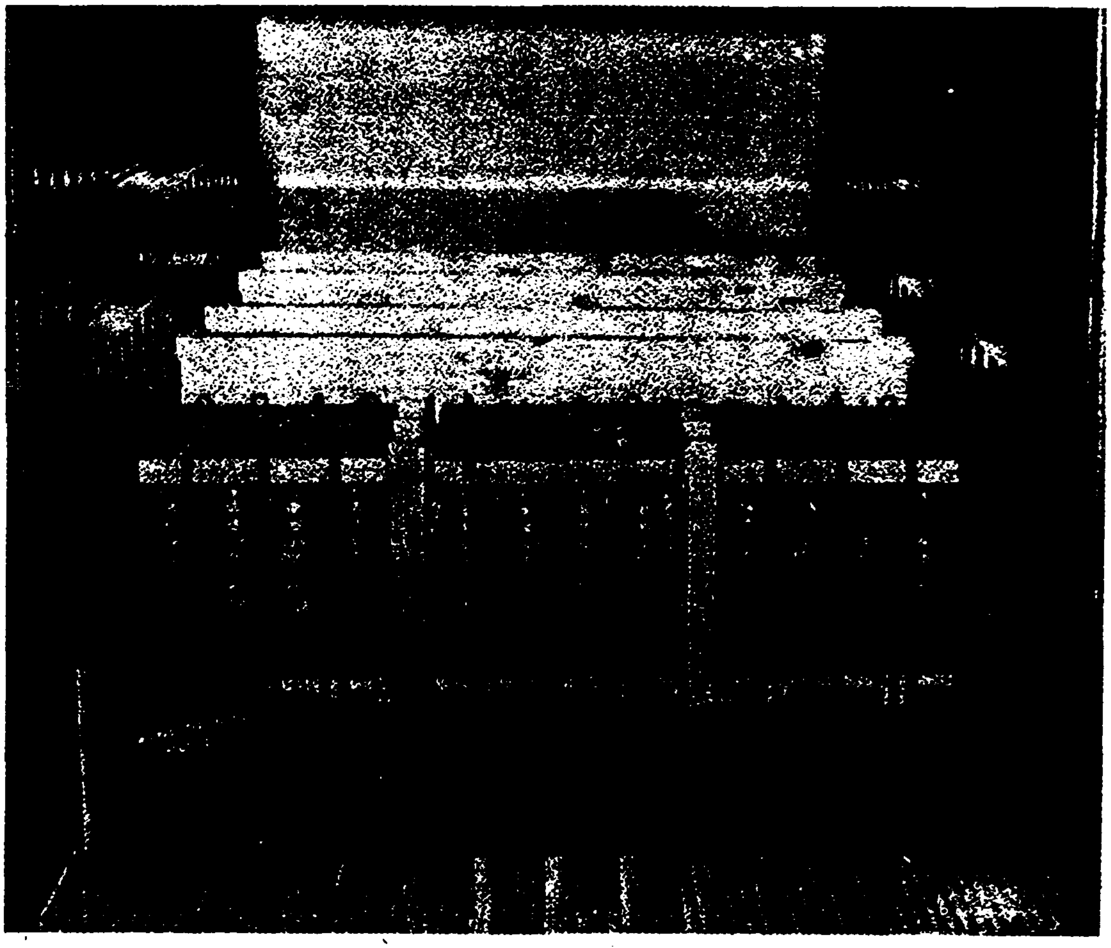


Figure 7 MILVAN (Ammunition Restraint)

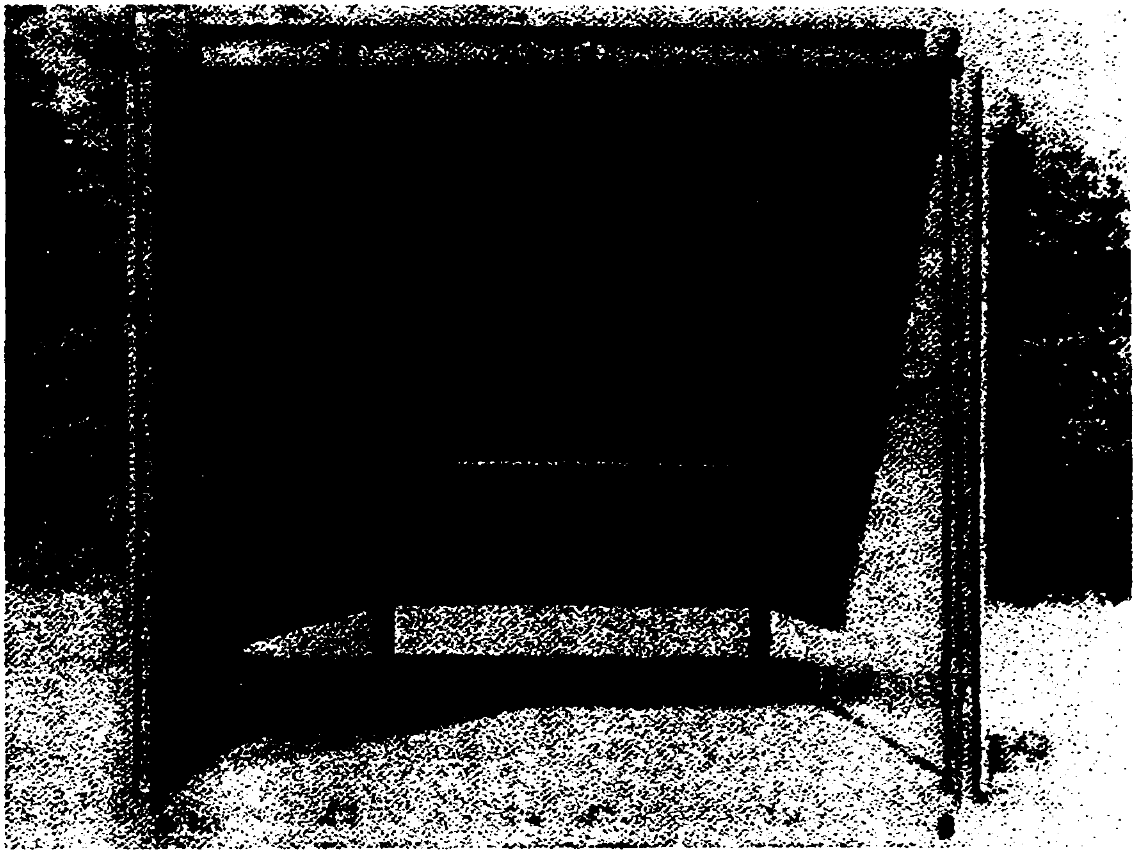


Figure 8 MILVAN (General Cargo)

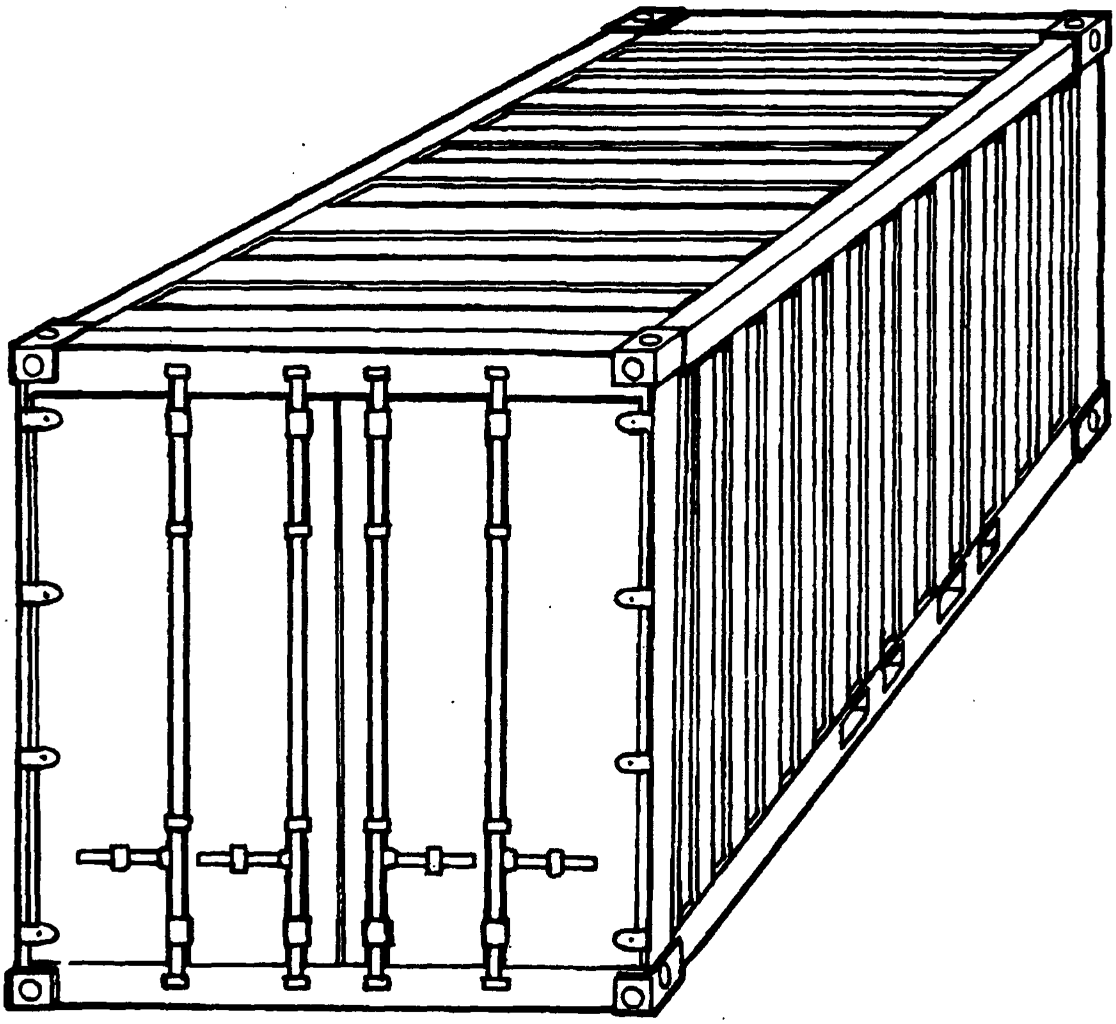


Figure 9 20 Foot ISO End Opening

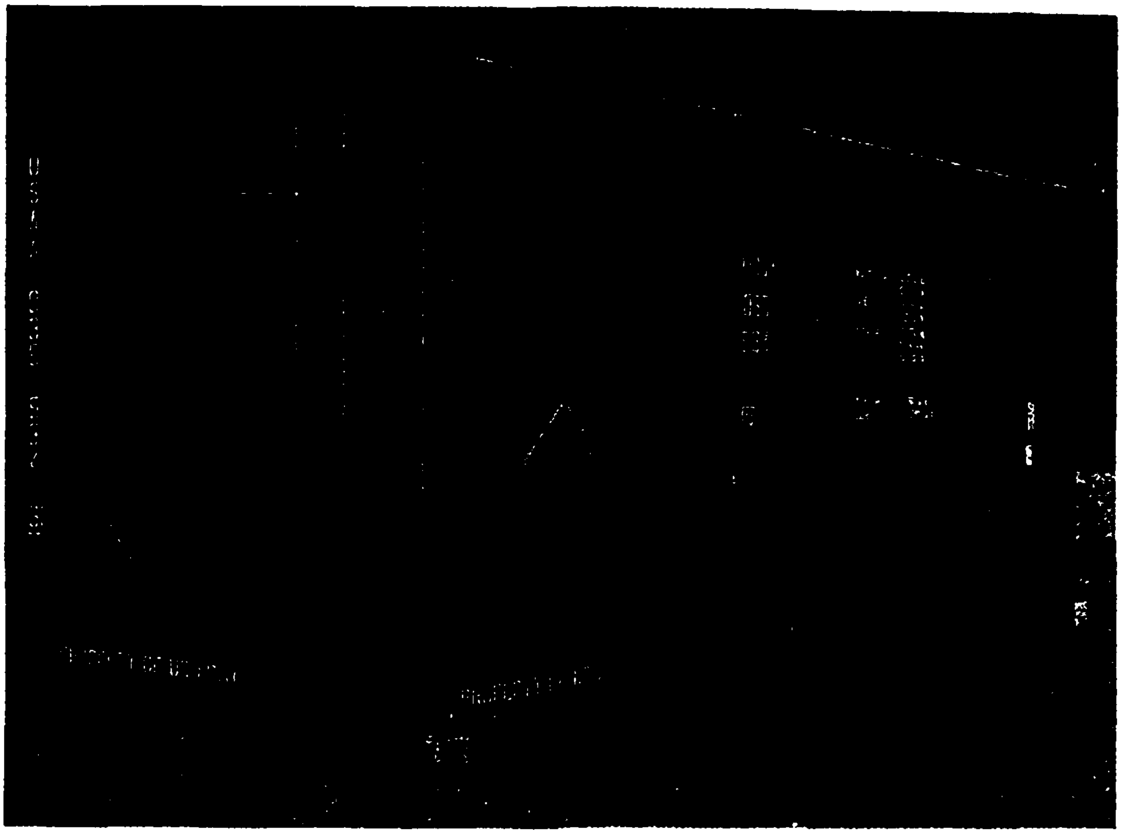


Figure 10 20 Foot ISO Side-Opening

Figure 11 Refrigerated Container

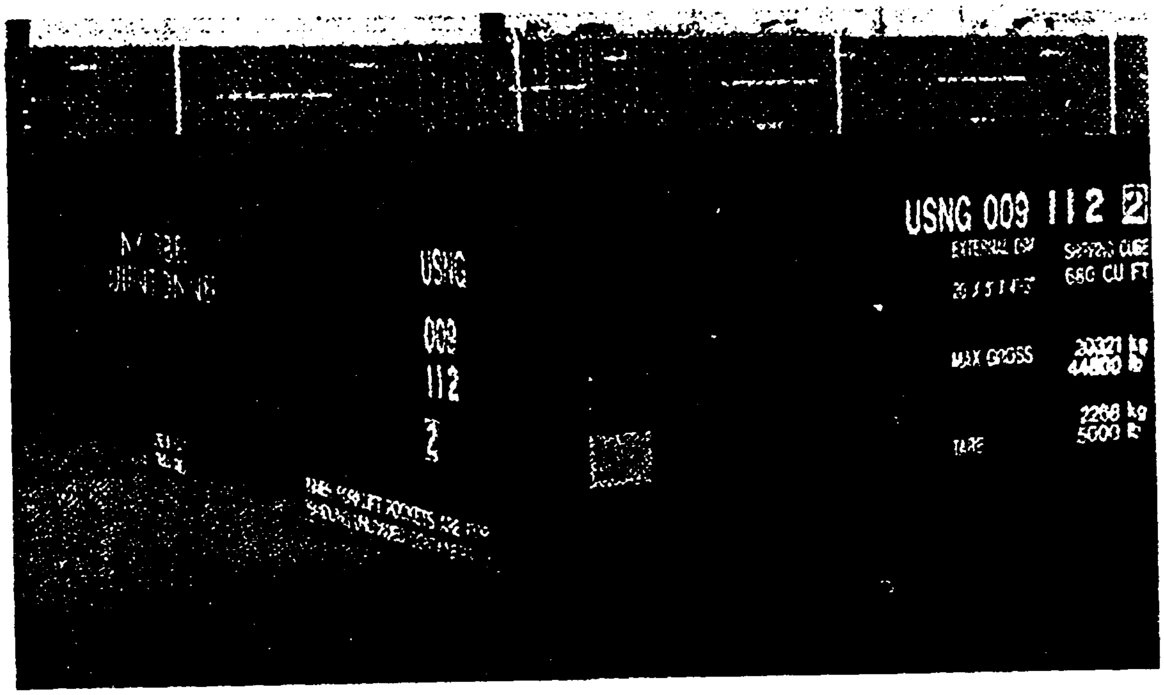


Figure 12 20 Foot Half-Height

Figure 13 ISO Tactical Shelter

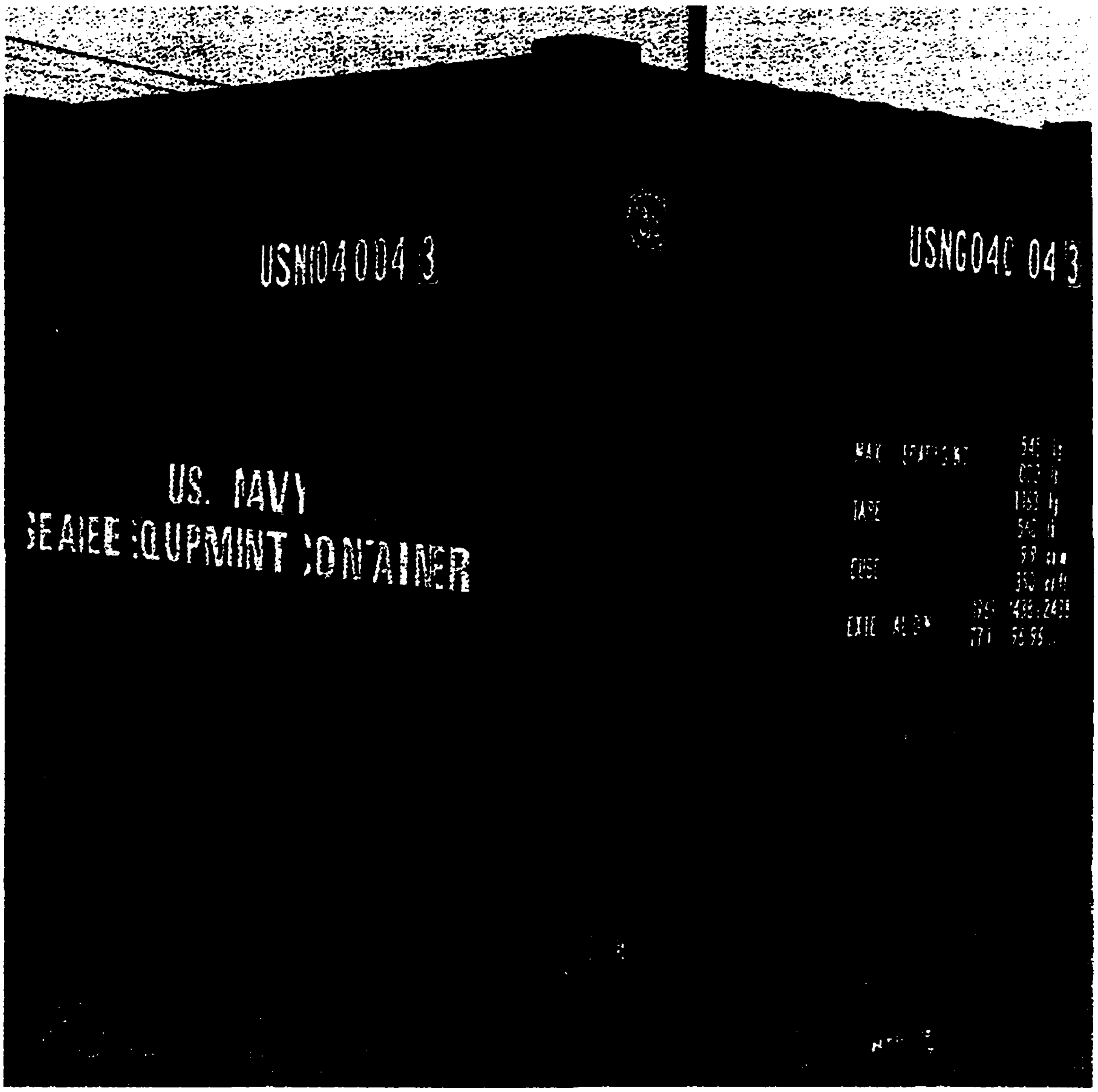


Figure 15 Triple Container (TRICON)

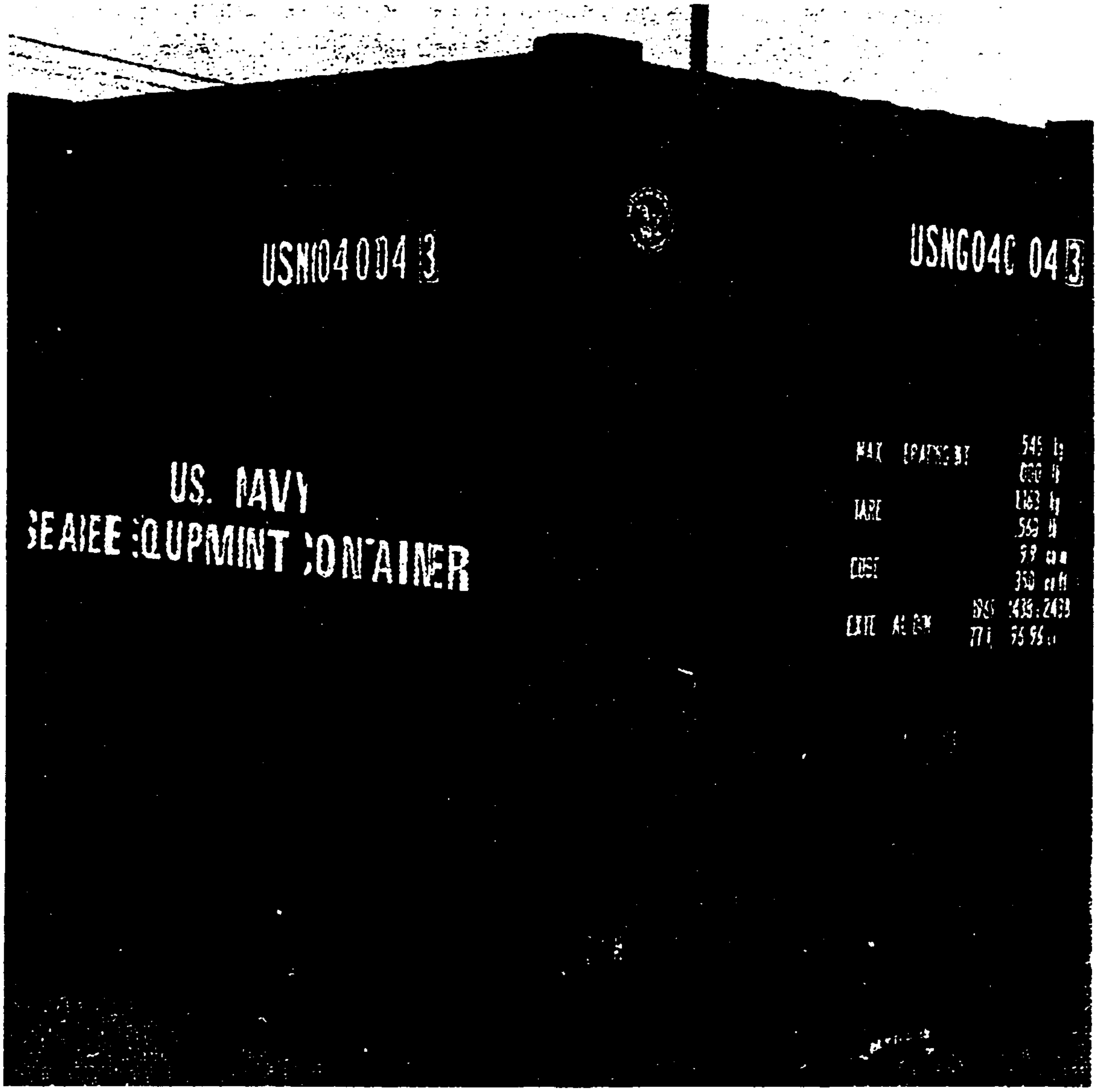


Figure 15 Triple Container (TRICON)

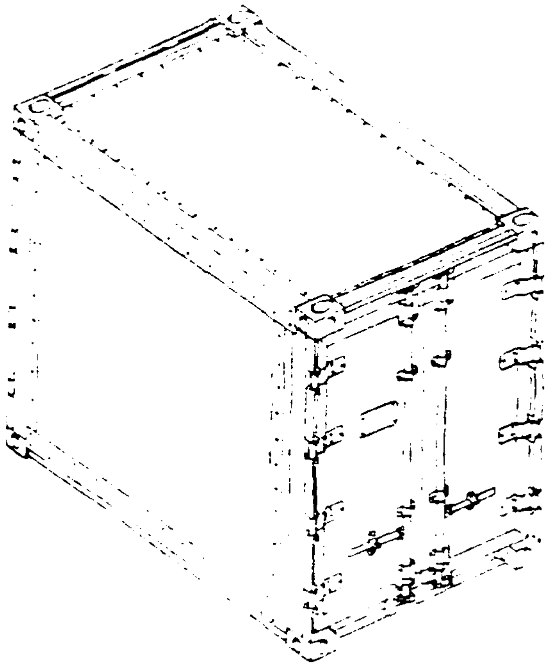


Figure 16 QUADCON

Figure 17 Assembled QUADCON TEU

Figure 18 Palletized Load System PLS Truck

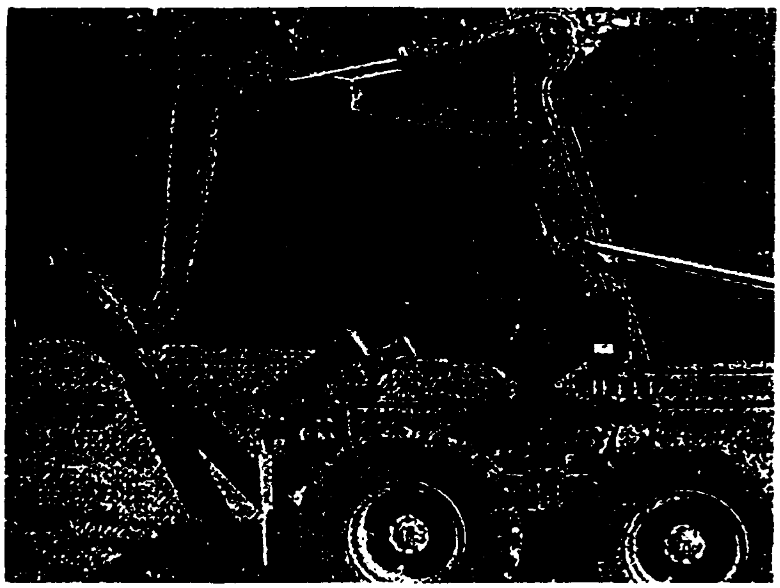


Figure 19 HIK System

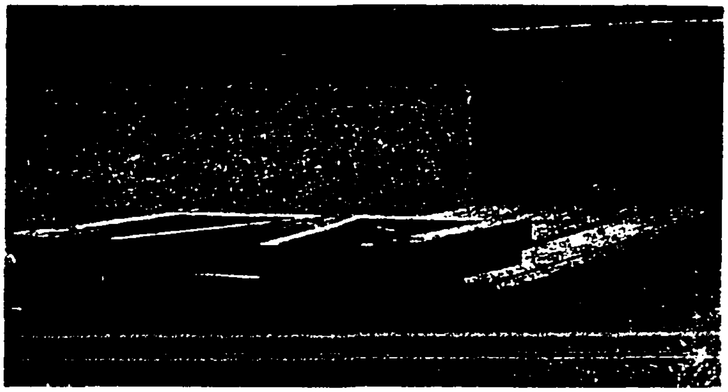


Figure 20 Ammunition Container (AMCON)

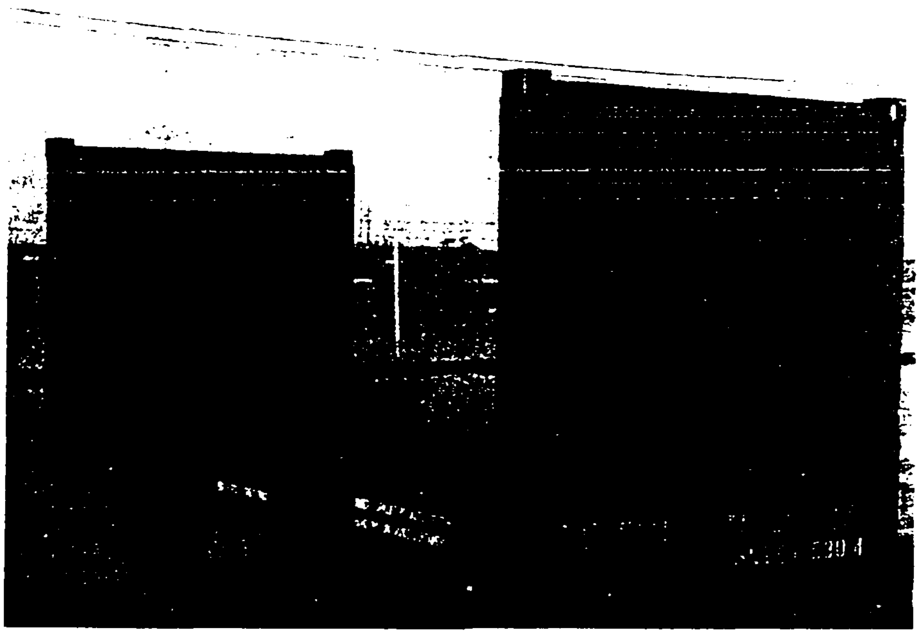


Figure 21 20 Foot Flatrack

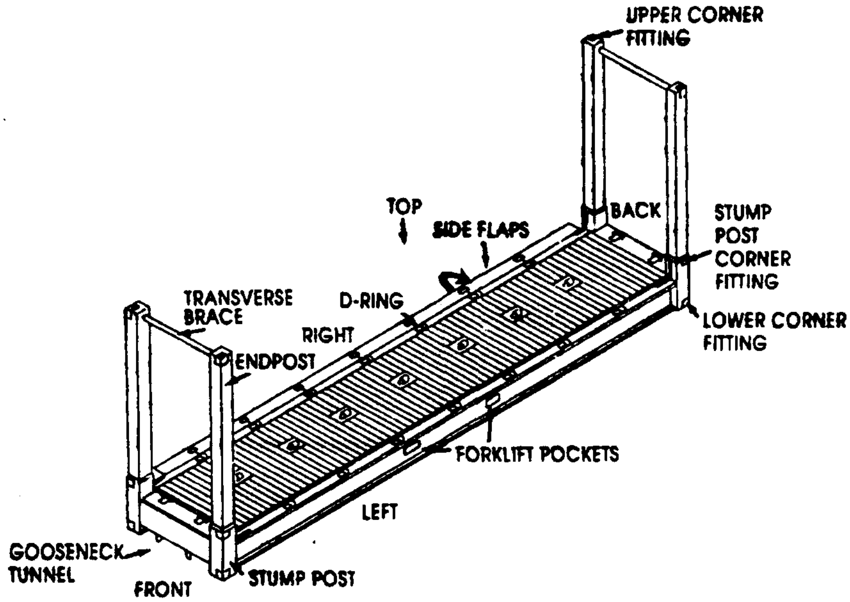


Figure 22 Heavy Duty Flatrack

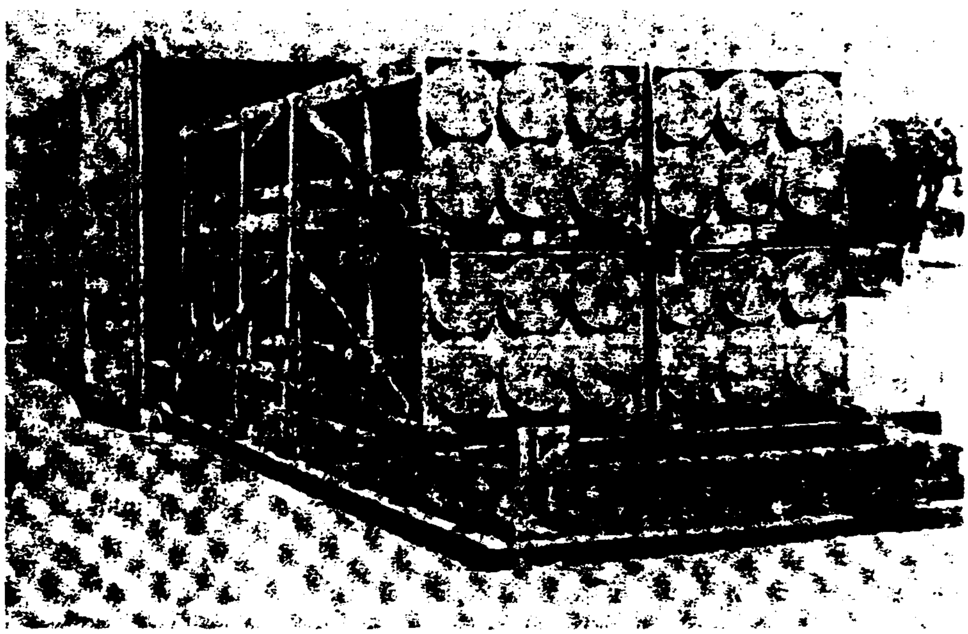


Figure 23 Load and Roll Pallet (LRP)

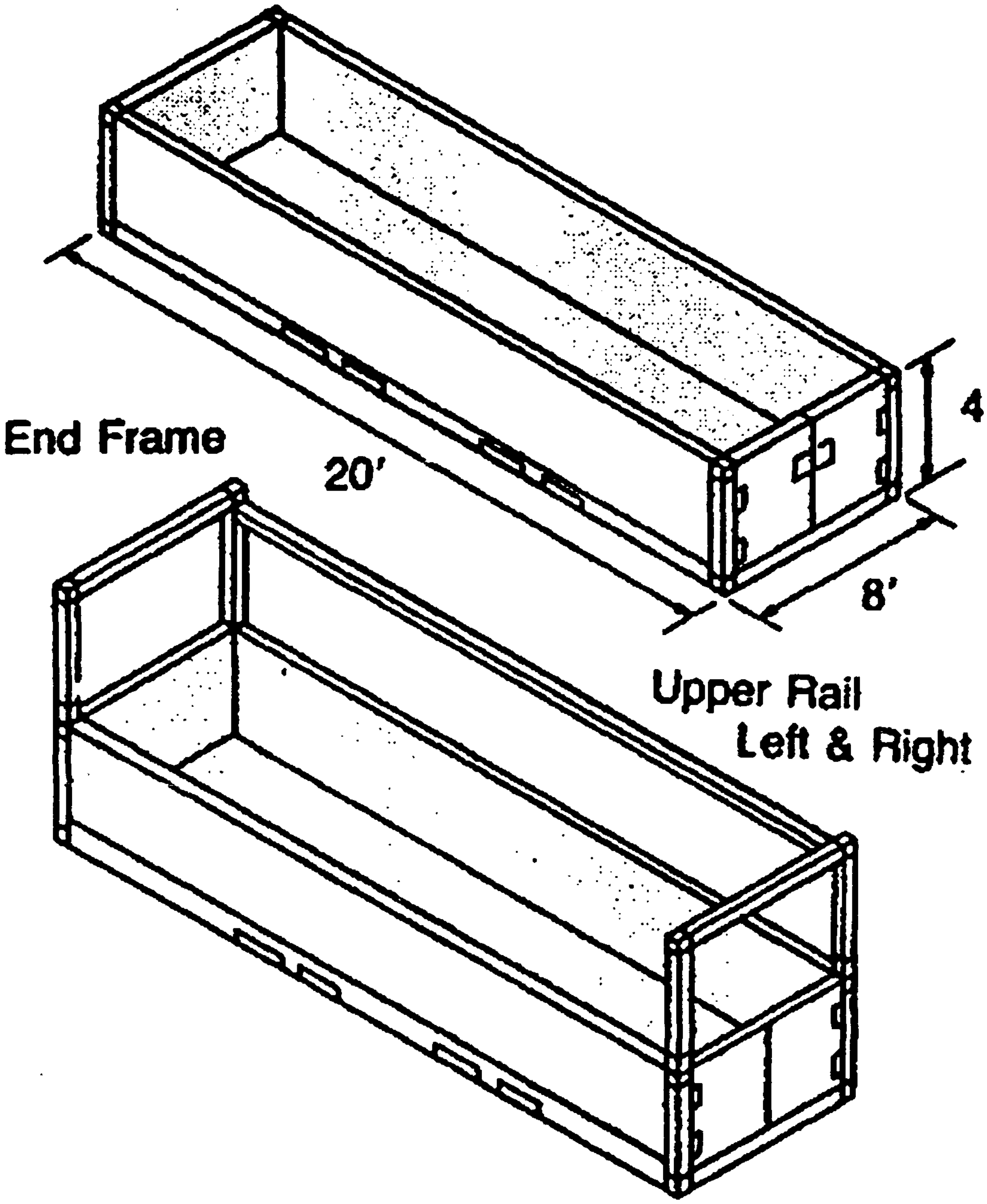


Figure 24 Half-Height with Expansion Frame

1. Army-Owned Container Inventory

Table 7 shows the Army-owned container inventory as reported by the Military Traffic Management Command (MTMC) that was available in June 1992. The majority of containers are identified as available for ammunition handling. MTMC reported that militarily useful containers used during Desert Shield/Storm were being identified by Forces Command (FORSCOM) so that MTMC could obtain International Organization for Standardization (ISO) certification. The identified containers could then be included in the container inventory, if deemed appropriate. No plans were then in place to procure

Table 7 ARMY-OWNED CONTAINER FLEET
MTMC CONTAINER INVENTORY AS OF JUNE 1991

Current Assets					
MILVAN (CADS)*	Commercial*	Half Height*	Side Opener*	Ammo Load/Roll Pallet[a]	Contingency (General Cargo)[b]
5,409	4,850	1,200	625	500	979

* Available for ammunition use. Total: 12,084

a. This is not a container, nor does it conform to ISO standards. These are used to unitize and further protect missiles inside boxes during the shipping process.

b. This type of container may be used to transport ammunition when released for general fleet use.

additional containers. (Memo MTPL-M (500-5a), MTMC, 24 Jul 92)

2. Equipment Deployment and Storage Systems (EDSS)

> Non-standard and locally fabricated storage aids have proliferated throughout the force. Many existing containers are poorly designed, hard to maintain, and do not provide the degree of containerization required for rapid and efficient movement of a deployed force. The concept, as part of the Army Containerization Master Plan, will provide for standardized deployment/storage systems capable of strategic and tactical delivery via both surface and air transportation modes.
>
> Prepackaged unit equipment and supplies in standard deployment/storage systems is the preferred method of operation as military strategy evolves from a policy of forward presence to a CONUS-based contingency force. (Concept Statement for the Equipment Deployment and Storage Systems, U.S. Army Quartermaster School, April 1992)

The U.S. Army Quartermaster School issued the above statement in April 1992 on the Equipment Deployment and Storage Systems concept. The school found that "suitable storage aids" had been lacking over the years, and in an effort to solve the problem, units at the local level had fabricated their own "storage aids." This resulted in "a proliferation" of "non-standard" storage aids which were hard to maintain, did not "provide the degree of containerization required", and in some cases, actually hindered their transportability using different transportation modes. The hampering of the transportability of the aids degraded the speed with and methods by which units could deploy, thereby "impeding deployment readiness and force closure."

In an effort to overcome these problems, the Equipment Deployment and Storage System program was established. The system is envisioned to:

> provide an increased capability for combat, combat support (CS), and combat service support (CSS) units to preload equipment and store and distribute Authorized Stockage List (ASL), basic, prescribed and operational loads, and equipment (Concept Statement for the Equipment Deployment and Storage Systems, U.S. Army Quartermaster Center & School, 28 April 1992).

Two types of EDSS "modules" will be employed, one for surface transportation and the other for air transportation. These modules are specifically limited to the deployment and storage required for unit deployments. They are not designed for sustainment operations.

The surface modules are designed for sea and ground transportation. They are designated Quadruple Containers (QUADCONs). Each container is 96 inches deep by 57.38 inches wide by 82 inches high, lockable, weatherproof, reusable, and has a gross weight of 10,000 pounds. The container has doors on both ends to allow full access and can be outfitted with shelves and compartments, if necessary. Four containers can be stacked and locked together to form a standard 8 foot x 20 foot ANSI/ISO container while maintaining access to all four units.

EDSS modules can be used in a warehousing capacity and can be used as a more permanent form of storage. They quickly can be made ready for deployment. The modules are an effort to have units *operate with containers as a normal course of business* so that container usage will not be unfamiliar.

B. SUMMARY

The DoD container inventory includes a wide range of container types in order to allow flexibility during operations. However, the majority of containers are to be used in the transportation of ammunition. The containerization of ammunition is a major component of surge deployment container requirements. Significant effort has been expended on developing containers that are readily connective between DoD and commercial carriers.

Connectivity with commercial carriers will be key to the use of containers and containerships during surge deployments. Units that routinely operate with containers can readily deploy by this method. As evidenced by the use of mobile facilities and tactical shelters, living and working spaces can be "containerized" as well. This will serve to increase the connectivity and compatibility with the commercial container industry.

VI. CONTAINER TRACKING AND VISIBILITY

A. BACKGROUND

Container management was a significant problem during Operations Desert Shield/Storm. It became nearly impossible for personnel in-theater to identify the contents of the incoming containers. In fact, of 40,000 containers sent to the theater, 25,000 had to opened and sorted through to identify the contents. (Department of the Army, Total Distribution Action Plan, p. 15, May 1992)

Operations Desert Shield/Desert Storm demonstrated the need for intransit visibility of sustainment material and personnel replacements being moved in support of operations. An essential requirement for commanders, transporters, shippers and receivers was to know where in the distribution system units, individuals, unit equipment, critical repair parts, weapon systems, or sustainment supplies are located. The basic function of all systems that provide a degree of intransit visibility is to assist in managing change. As priorities change, intransit visibility provides the necessary tool to adjust flow in the supply pipeline. (Department of the Army, Total Distribution Action Plan, p. 29, May 1992)

The lack of visibility is directly related to the lack of confidence in the supply system. This leads to duplicate requisitions, needlessly straining both the industrial base and the distribution system. Duplication of requisitions, diversion of Class I shipments, replacement units impacted by sealift diversions, and airlift reprioritization are examples of how the lack of intransit visibility impacted negatively upon theater operations. This impact also extended to CONUS and Europe. However, the sophisticated communications network in CONUS and in Europe facilitated a greater degree of visibility than was available in the SWA theater since some intransit data and queries could be passed to CONUS based systems. (Department of the Army, Total Distribution Action Plan, p. 29, May 1992)

The lack of intransit visibility can be tied to a number of factors: 1) lack of discipline in the process to document cargo and close out transactions; 2) automated systems which either were not fielded at all or did not

have adequate capacity; 3) inadequate communications; 4) the lack of a comprehensive intransit visibility data base; 5) the lack of detail currently required in some documentation regulations; and 6) inadequate supporting force structure in the theater early. (Department of the Army, Total Distribution Action Plan, p. 29, May 1992)

A key component of intransit visibility is the ability to query the distribution system to determine the status of requisitions, receipts, arrivals, departures, diversions, and the identity of carriers. While a number of supply and transportation systems contain some of the needed data, currently no comprehensive intransit visibility data base with a supporting communications architecture exists which contains all the data necessary to answer such queries. The lack of intransit visibility of items led to an inability to identify when a needed shipment would be delivered, to divert/redirect shipments in the corps and theater, or even to identify the contents of containers. Stocks moving through the distribution network cannot be intercepted to change the consignee or to redirect to a consignee that has moved to another support activity or location. (Department of the Army, Total Distribution Action Plan, p. 33, May 1992)

The Army's Logistics Control Activity (LCA) Logistics Intelligence File (LIF) consolidates some of the needed information, but the LIF is hampered by its batch processing times and those of the source data systems. In addition, incomplete information is provided by these source systems. MILSTAMP does not require that all pertinent transportation data, such as SPOD receipt and lift, be forwarded to the LCA, and there is insufficient detail in some transportation documentation to meet the requirements of theater item managers. Cumbersome documentation procedures at the source and receiving activities also cause incomplete data to be generated. Without complete shipment, receipt and lift data, the Logistics Control Activity (LCA), which is responsible for management of the Army material pipeline, is operating blind. Only limited requisition status information is available. The large volume of traffic during a crisis situation exacerbates this problem. (Department of the Army, Total Distribution Action Plan, p. 33, May 1992)

The essential characteristic that is being looked for is the ability to query the distribution system at any point along its path (critical nodes) and determine status in a matter of minutes or several hours, not in 24, 48, or 72 hour bursts as is the case with the LIF. Additionally, the desire is to be able to accomplish a tracking capabil-

ity similar to what industry currently does with its hardware, software, and communication systems. The military system as it exists today cannot respond immediately to a simple request to locate a particular unit, piece of equipment, or spare part. (Department of the Army, Total Distribution Action Plan, p. 33, May 1992)

B. TOTAL VISIBILITY CONCERNS

The previous section highlighted some of the difficulties experienced in tracking containers and container contents and pointed out areas of significant concern that require corrective efforts. It also brought to light the type of information and its timeliness required by commanders in order for them to make sound tactical decisions. The perspective, though, was more from the consumer of lift, such as deploying forces, than from that of the provider of lift. The lack of visibility of container assets experienced by forces in Southwest Asia was also experienced by the providers of lift and it was similarly frustrating.

In Chapter III of this thesis, the differentiation between "strategic" and "unit-owned" containers was noted. Briefly, strategic containers are viewed as part of the Defense Transportation System (DTS) container pool and are merely used as platforms for the movement of material. Once a lift has been completed, the container is returned to the DTS pool for reuse. Unit-owned containers are listed as unit equipment (carried on the Automated Unit Equipment List [AUEL] and as an asset in the Unit Property Book) and remain with the unit

while it is on its mission. The distinction between containers, as either strategic or unit-owned, impacts the tracking and visibility of those containers by the transportation providers.

Military Traffic Management Command (MTMC) and Military Sealift Command (MSC) do not have visibility of all Unit Equipment containers. Another difficulty arises when commands, in response to a contingency, procure or lease their own containers to support their deployment. These containers essentially become unit equipment, and are invisible to MTMC and MSC (Levine, MTMCHQ, Interview, Jul 1992). To the extent that MTMC and MSC are unaware of these ccntainers, then estimates of lift requirements may be too low. Considering the number of commands affected by a mobilization, the quantity of augmented containers can swell the number of containers requiring lift by considerable proportions. The problem of invisible containers was experienced during Operation Desert Shield by MTMC and MSC.

C. TRACKING

1. Commercial System

Commercial carriers usually operate on a "hub and spoke" system. This entails receiving/discharging nodes (spokes) feeding containers to and receiving containers from transshipment points (hubs). Containers are transported to hubs for consolidation with other containers going in the same

direction or for delivery to the customer. The outbound containers are then lifted by a vessel to another hub, possibly broken apart again to be further transshipped through other hubs on other vessels, broken down at the hub nearest the customer, delivered to the node nearest the customer, and ultimately delivered to the customer.

U.S. carriers assign voyage document (voydoc) numbers to individual vessel moves, many times "by port." When containers are transshipped, voyage document numbers do not change, but vessels do. Commercial information management systems are extremely well suited for tracking containers through these types of moves. However, using commercial carriers to transport military containers causes a loss of visibility to the military transportation information management system because of successive transshipments. (Lennon, MTMC-TEA, Interview, Jul 1992)

To illustrate the problem transshipments cause DoD, consider the following example: Commercial container vessel 1 leaves a CONUS SPOE, port A, with a container slated to go to Dammam, the SPOD. The vessel is assigned voydoc XYZ. Vessel 1 is manifested by DoD for delivery from Port A to Dammam. The SPOD is notified that vessel 1 left port with containers destined for delivery there. Voydoc XYZ is included as part of the container's TCN. Vessel 1 proceeds from port A to CONUS port B, the firm's container hub, where the container is consolidated with other containers destined for the

same geographic area and is put on board vessel 2. The carrier notes the change from vessel 1 to vessel 2 in their tracking system, but the SPOD is not directly notified. Loss of visibility starts here. Vessel 2 proceeds to the Mideast and arrives at port C, the firm's Mideastern hub. At this hub, the container is transferred to vessel 3, a feeder vessel, for delivery to Dammam. Again, the carrier notes the change in vessel, but the SPOD is not directly notified. Vessel 3 arrives in Dammam with the container plus other containers that started out in similar fashion. The military expects and prepares for vessel 1 and the containers it left the SPOE with, but vessel 3 arrives carrying some of those containers plus other containers similarly transshipped. (Priber, MTMC-HQ, *Interview*, Mar 1993) This transshipment process is very efficient for the carriers, but causes the container to be "lost" from the military's point of view.

As a result of this type of visibility problem, the container operations conducted in support of the Somalia relief effort were controlled by Military Sealift Command (MSC) from the port of Alexandria, Egypt. All containers destined for Somalia had to be transshipped through Alexandria because vessel size was restricted in Somalia ports and smaller vessels were needed. MSC set up a field office in Alexandria to specifically manifest the feeder vessels headed for Somalia so that problems of the type described in the previous

paragraph would not experienced again. (Priber, MTMCHQ, Interview, Mar 1993)

Commercial carrier manifests are also significantly different from DoD manifests. Military manifests add no value to the carrier's tracking system, and are not referred to on the commercial manifest or voyage documents. Since DoD does not track by voydoc and does not have access to the commercial tracking system, the material suffers a further loss of visibility to the military transportation system. (Lennon, MTMC-TEA, Interview, Jul 1992)

2. Department of Defense System

> The logistics community has developed a large number of information systems that are essentially "little islands" of information and do not exchange data between them. (Erbertowski, p. 29, April 1992)

DoD has developed a wide range of transportation information management systems to support and plan for both peacetime and wartime missions. The following is a list of transportation information management systems currently affecting sealift operations and is provided so that the reader may grasp the immensity of the Defense Transportation System (Logistics Automation Master Plan, June 1992):

- ACI - Automated Carrier Interface
- ASPUR - Automated System for Processing Unit Requirements
- AUEL - Automated Unit Equipment List
- CFM - CONUS Freight Management
- CODES - Computerized Deployment System

- COMPASS - Computerized Movement Planning and Status System
- DAMMS-CMM - Department of the Army Movements Management System-Cargo Movements Module
- DAMMS-MPM - Department of the Army Movements Management System-Movements Planning Module
- DAMMS-R - Department of the Army Movements Management System-Redesign
- DASPS-E - Department of the Army Standard Port System-Enhanced
- FMCS - Freight Movement Control System
- IBS - Integrated Booking System
- ITV - Intransit Visibility
- JOPES - Joint Operation Planning and Execution System
- JOPS - Joint Operation Planning System
- LIF - Logistics Intelligence File
- MAPS II - Mobility Analysis and Planning System
- METS II - Mechanized Export Traffic System
- MOBSCOPE - Mobilization Shipments Configured for Operation, Planning and Execution
- SEACOP - Strategic Sealift Contingency Planning System
- TC ACCIS - Transportation Coordinator Automated Command and Control Information System
- TERMS - Terminal Management System

The following new systems are proposed:

- MASS - MOBCON Automated Support System
- MOBSS - Mobilization Support System
- SEASTRAT - Sealift Strategic Planning System
- STA - Strategic Transportation Analysis
- WPS - Worldwide Port System

Each of the aforementioned systems was developed with specific strategic objectives in mind, however, as a whole, their massive organization contributes to the loss of visibility through a lack of connectivity. In addition to the complexity of the system in and of itself, user interface also plays a significant role in the effectiveness of the information management systems.

Many of these systems are not "user friendly" and are hard to use. For example, JOPES is a classified, CINC level operational planning tool which determines lift requirements using Unit Line Numbers (ULN's), which are not sourced back to a UIC. Much of the planning done with JOPES affects TC ACCIS, which is used to determine actual lift requirements. TC ACCIS is unclassified and uses Unit Identification Codes (UIC's). Each UIC can have several ULN's (part air and part surface). (Fox, ODSCLOG, Interview, Jul 1992) Figures 25 through 28 illustrate the interrelationships between the existing and proposed systems.

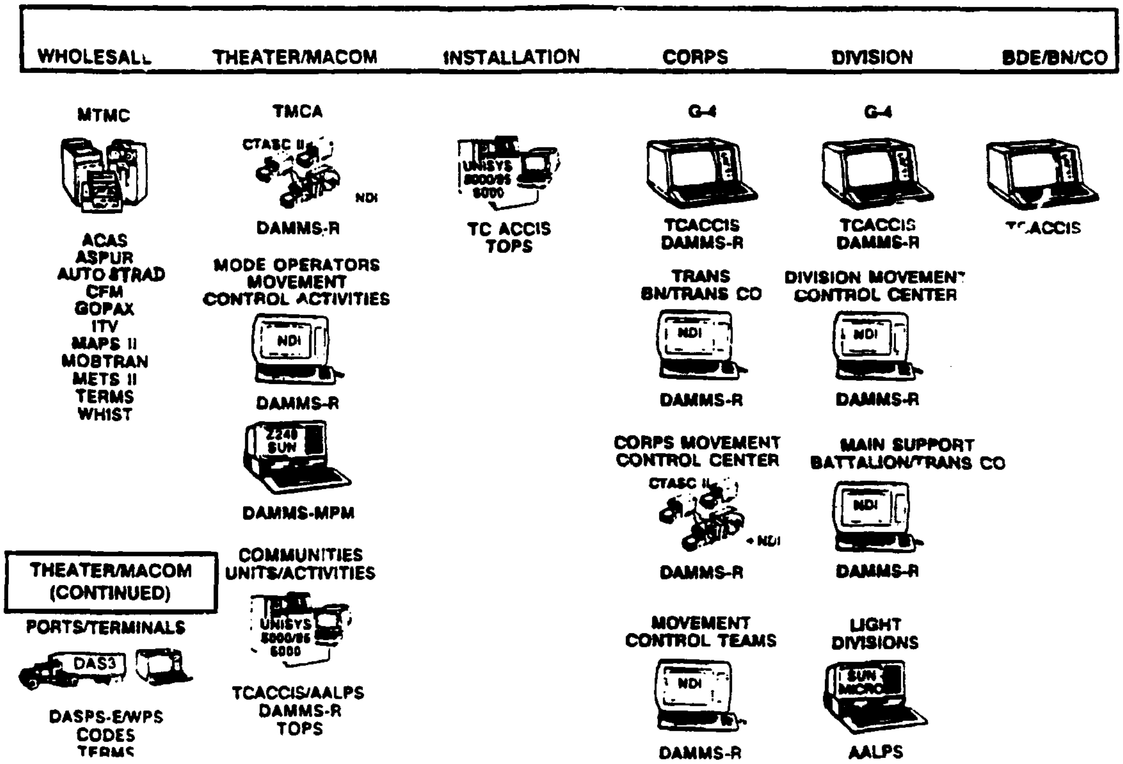


Figure 25 Transportation Automation Fiscal Year 92-93
Source: Logistics Automation Master Plan June 1992

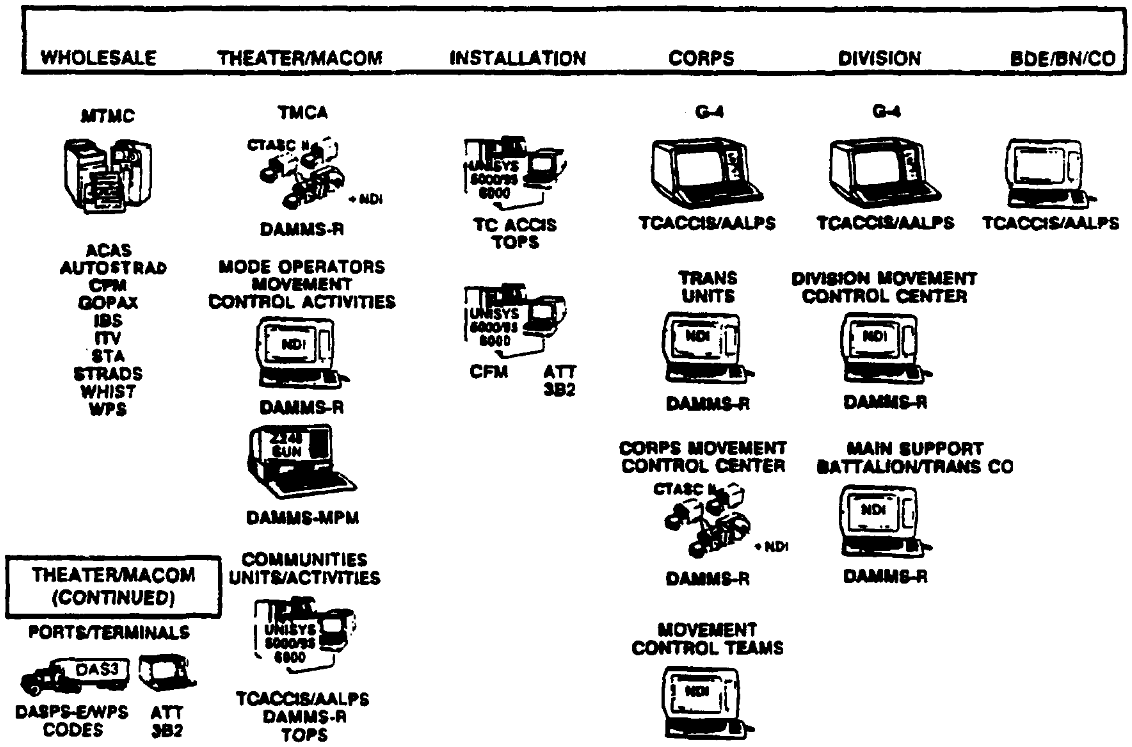
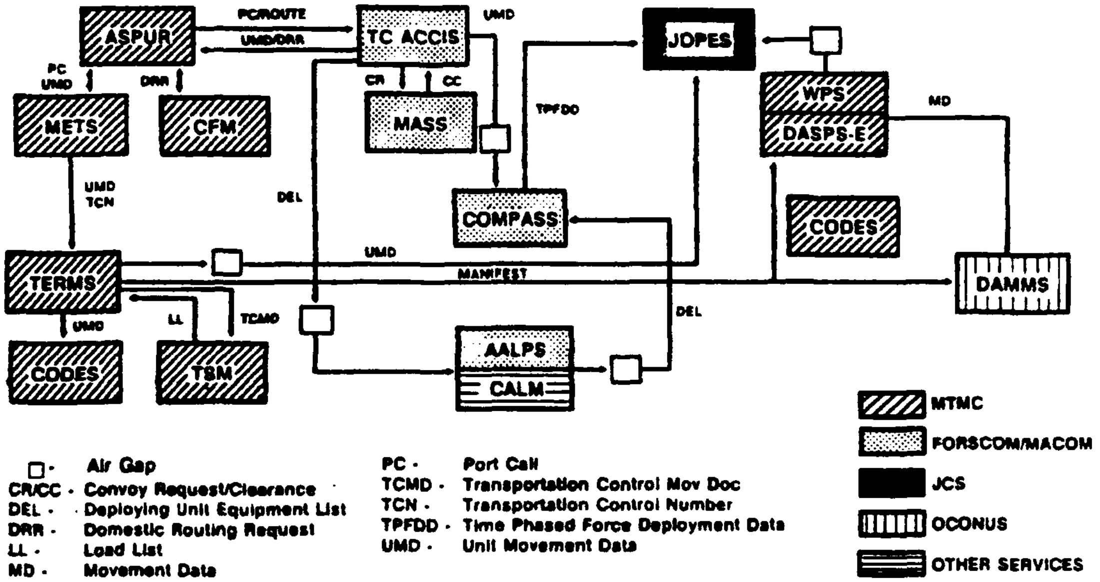


Figure 26 Transportation Automation Fiscal Year 94-98
Source: Logistics Automation Master Plan, June 1992



AALPS - Automated Airload Planning System
ASPUR - Automated System for Predetermining Unit Rqmts
CALM - Computer Aided Load Manifest
CFM - CONUS Freight Management
CODES - Computerized Deployment System
COMPASS - Computerized Movement Planning & Status Sysem
DAMMS - DA Movements Management System
DASPS-E - DA Standard Port System-Enhanced
JOPES - Joint Operation Planning & Execution System
MASS - MOBCON Automated Support System
METS - Military Export Traffic System
TERMS - MTMC Terminal Management System
TSM - Terminal Support Module
WPS - Worldwide Port System

Figure 27 Near Term Integrated Unit Move DTS/JOPES
Source: Logistics Automation Master Plan

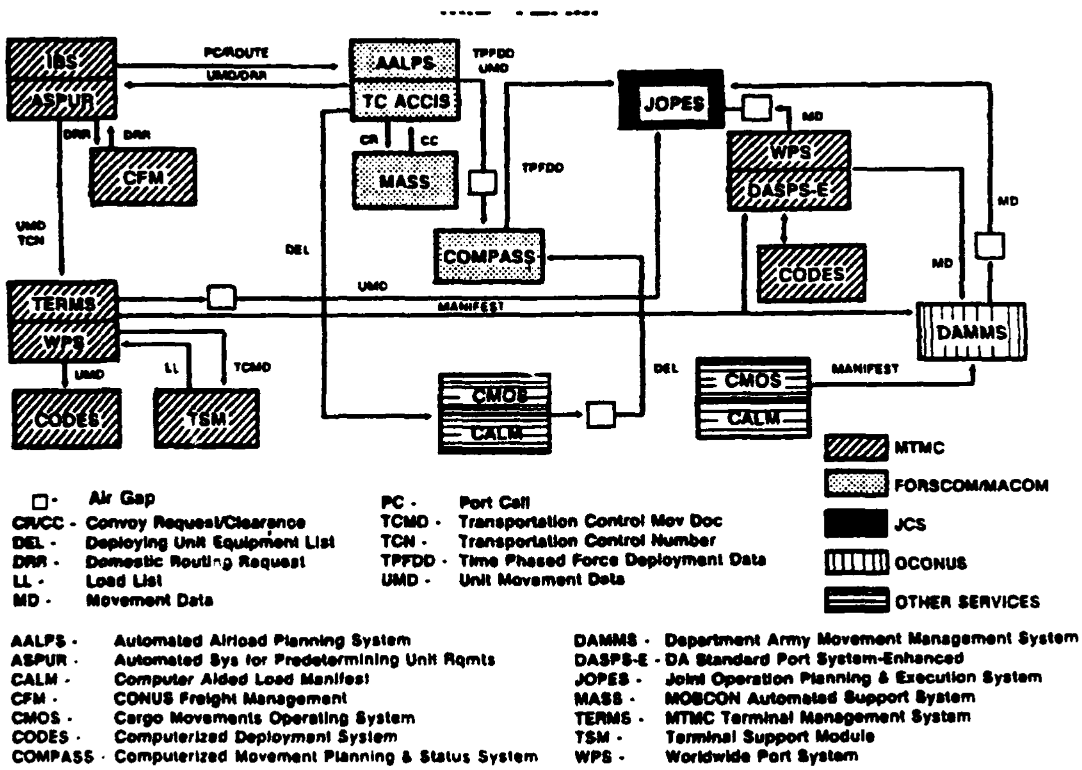


Figure 28 Mid Term Integrated Unit Move DTS/JOPES
Source: Logistics Automation Master Plan, June 1992

3. Documentation

Proper documentation is crucial for accurate and timely in-transit visibility. In-transit visibility requirements exist for both the container and the contents. The problem with lack of visibility starts not with the use of containers, but with the lack of proper content documentation, known as backup documents. The missing link in the visibility of in-transit material during Operations Desert Shield and Desert Storm was not the containers themselves, but rather the lack of adequate documentation of contents (backup documents) (CAPT Hinson, MTMCHQ, Interview, Jul 1992).

Individual containers could be tracked in the DoD system with some degree of accuracy, but not in real time. The Joint Container Control Division (JCCD) in Bayonne, New Jersey tracks only ammunition containers by the DoD Activity Address Code (DODAAC), basically a UIC, and container serial number. From a DoD documentation perspective, when a command requests the status or whereabouts of a container from MTMC, MTMC must query MSC, which then must query the ship for location. The ship then responds to MSC. MSC then responds to MTMC, and MTMC finally reports back to the requesting command. Each container is assigned a Transportation Control Number (TCN). The TCN does not change when a transshipment occurs, and is tracked fairly accurately by the transportation information management system. Problems do arise, however, with

inaccurate TCN's. They can cause material to be misrouted or become unidentifiable. TCN's can be assigned at the home installation, but also by consolidation point. (Ford, MTMCHQ, Interview, Jul 92)

The container content manifesting process is also crucial to in-transit visibility. This step is still done manually by physically typing entries for shipping documents for each item in the container either on a document or into a computer which then generates a document. The manifest is then built from these documents. The current Military Standard Transportation and Movement Procedures (MILSTAMP DoD 4500.32R) manual does not require every field to be annotated in order for the shipment to move. This can result in very generic manifests being produced. It should be noted that the decision to do only the minimum MILSTAMP requirements was a conscious one made "by all concerned" in order to get material moving quickly (LTC Cella, ODSCLOG, Interview, Jul 1992). The manifests are then used as the basis for the Container Content Report which is supposed to precede the container to the SPOD. In all too many cases, the report "goes nowhere" or the "cargo arrives before the manifest" (Ford, MTMCHQ, Interview, Jul 1992). DoD essentially remains a "hard-copy oriented system."

4. Technology

As can be seen by the interrelationships between individual systems, even a knowledgeable person could quickly become overwhelmed by the immense scope of the system and the ripple effects which changes in one system can have on others. Ebertowski and Sweeney noted in 1992 that an Israeli observer had stated: "U.S. weapons are designed by engineers for engineers whereas Soviet weapons are designed for the combat soldier." (Ebertowski, p. 31, 1992). The same sentiments were echoed by Colonel Fields of Military Sealift Command when he noted that transportation management information systems are "just too complicated for 'Snuffy' to use." "Snuffy" is jargon for the normal, average soldier. (Col. Fields, MSCHQ, Interview, Jul 1992). Both of these observers noted that technology can be overwhelming and that "simplicity is as relevant to information management systems as it is to combat operations." (Ebertowski, p. 31, 1992)

The need for real time feedback to commanders is quite clear, however many of the transportation information management systems are of 1960's technology. Tracking by Radio Frequency (RF) has been used on some shipments, however this method has been reserved for very high visibility cargoes and some hazardous materials. (Ford, MTMCHQ, Interview, Jul 1992) Bar coding of container contents is also well within current technological capabilities, but the earliest bar coded accounting systems for container contents may be a few years

away. (Levine, MTMCHQ, Interview, Jul 1992) Logistics Applications of Automated Marking and Reading Symbols (LOGMARS) and Electronic Data Interchange (EDI) are currently available and in use.

As new generations of computers come into service, they are intended to be incorporated into the transportation information management system. The automating of source data is viewed as a critical key to obtaining total in-transit visibility. Objectives for the modernization and real-time interface of various components of the DTS are divided into three sets of objectives: 1) Near Term -- Fiscal Years 92 and 93, 2) Mid-term -- Fiscal Years 94 through 98, and 3) Long-Range -- Fiscal Year 99 through 2008. The Near-Term objectives are:

- Improve rapid deployment capability and movement command and control through development and fielding of integrated systems.

- Improve the availability and quality of standard transportation data and continue efforts toward data standardization. (Logistics Automation Master Plan, p. 8-2, June 92)

Mid-Term objectives are:

- Complete interface or integration of transportation automated information systems. Continue fielding and provide training through classroom and automated tutorials.

- Field the following transportation automated systems:

  **TC ACCIS/AALPS

  **Department of the Army Management System (DAMMS)

  **Worldwide Port System (WPS)

**CFM

**TOPS

- Incorporate the concept of Total Asset Visibility (TAV) into existing and evolving transportation information systems.

- Support USTRANSCOM's efforts to develop the Global Transportation Network (GTN) as the vehicle to update JOPES with execution data. (Logistics Automation Master Plan, p. 8-3, Jun 1992)

The Long-Range objective is:

- Modernize/enhance transportation automated systems, as required to meet the on-going evolutionary changes necessitated by the concepts included with Air-Land Battle-Future:

  **Reduce reliance on paper documentation through the use of micro-circuit technology in logistic applications (MITLA) in transportation automation. Replace LOGMARS with MITLA.

  **Incorporate automated interfaces across functional lines, e.g., the provision of battlefield intelligence to assist transportation planners in the formulation of movement plans. (Logistics Automation Master Plan, p. 8-3, Jun 1992)

5. Forces Command Container Action Plan

FORSCOM is currently drafting its container action plan. Containers are envisioned to deploy with unit equipment "to ensure unit integrity." All unit equipment containers, whether unit-owned or commercially obtained, will be identified in a unit's movement plan. Unit equipment containers would be designated as either critical or non-critical, depending on if the contents would "affect a unit's ability to

perform its mission." (Draft, FORSCOM Container Action Plan, p. 2, Jan 1993)

Unit equipment containers will have a Shipment Unit Number (SUN), UIC, and container number clearly marked "on the front door." A waterproof shipping tag (DD 1371-1) will be affixed as well. A packing list (DD 1371) will be inside each container. FORSCOM directs MTMC to "constantly" monitor the in-transit visibility of the containers. Due to problems with loss of visibility when transshipping occurred during Operation Desert Shield/Desert Storm, transshipping will not be authorized. FORSCOM intends that containers be shipped directly to the SPOD, and will direct that MTMC ensure contracts include this requirement. (Draft, FORSCOM Container Action Plan, p. 2, Jan 1993)

D. SUMMARY

The logistical system has proven itself capable of delivering massive amounts of material thousands of miles from our shores, yet when tasked to provide an answer to a "simple" question of the whereabouts of a particular piece of equipment, the answer many times requires days. The problem of loss of visibility begins before the material starts its journey. Timely and accurate visibility of in-transit material begins by ensuring that initial documentation is fully and correctly completed. Without it, material will quickly become lost in the pipeline.

The task of producing all of the "hard" documents required to support movements of this scope is tremendous. New technologies must be developed and brought on line to assist in this endeavor. Connectivity between transportation information management systems must occur in order to be able to access the true potential of the speed and capabilities of the current generation of computers. The transportation information management systems must also be "user friendly" so that people like "Snuffy" are able to easily operate them.

VII. CONCLUSION AND RECOMMENDATIONS

The Department of Defense (DoD) has directed the utilization of containers as the preferred method of shipment for defense cargo. The use of containers is expected to produce cost reductions and economies of scale similar to those produced in the commercial sector. A move to containers, whether in peace or war, and away from traditional breakbulk operations carries with it the cost of new material handling methods and equipment, plus the retraining of material handlers.

Retraining is an especially important task, both for those who work with containers, such as cargo handling units, and for fighting units which must operate with them. Military contingency operations in the foreseeable future will entail the utilization of CONUS-based forces which may be rapidly deployed to crisis areas in different parts of the world. The Army Strategic Mobility Plan (ASMP) goal, founded on a CONUS-based forces strategy, requires force closure of three divisions, two by sea and one by air, within thirty days, and the full Contingency Corps within seventy five days. In order for this strategy to be effective, forces must be tailored to fit this new mission. This requires the Contingency Corps to be able to deploy rapidly, effectively, and efficiently, using multiple modes, as well as be readily self-sustaining. The

use of containers is a significant component of the ability to fulfill this new mission.

Container use must be phased into operational units in the course of normal operating procedures. Reserve units must also become familiar with containerization requirements. Container use must not be new or unique, but rather commonplace. Containers can serve as temporary storage facilities and also as work and living spaces. A rapid deployment force operating, by design, out of containers will have a much faster response time than a force that must first obtain and then stuff and unstuff containers.

The ability to obtain containers is also a crucial component of the Rapid Deployment strategy. The units designated as surge deployers should be equipped with sufficient containers to conduct the deployment, or they must have immediate access to a supply of containers. The Department of Defense and commercial carriers need to work together so that DoD may have visibility of available commercial assets for planning purposes and have ready access to them should a contingency arise. Contracting methods must be modified so that containers may be leased or procured virtually immediately upon receiving orders to begin to deploy. Valuable time will be lost if containers are not quickly and readily accessible.

Maintaining large fleets of containers to be used primarily for contingencies will be too expensive. The large cost of the containers, the associated material handling equipment,

and the required maintenance, would be incurred without significant benefit if no contingencies arise; most of the containers would ostensibly wait for a crisis to occur. The use of unit-owned containers is recommended for the initial designated surge deployers, with leased strategic containers used for the later deploying sustainment and resupply forces.

Planning for rapid deployment contingencies will be critical. During the last three major contingencies, Time-Phased Force Development Data (TPFDD)-planned scenarios did not resemble the real crisis. New plans were essentially developed as the situation unfolded. This has led some in the transportation community to question the validity of the TPFDD process and the transportation requirements built around these plans. The sealift providers must have a reliable means of determining the quantity of sealift required. Planning systems are needed that are user friendly and have connectivity with other major players in defense transportation.

In order to deploy more rapidly, maintain increased unit integrity, plus have the ability to conduct operations upon arrival at the Sea Port of Debarkation (SPOD), vehicles will very likely be transported with full combat loads. Ammunition will be a critical requirement and has been acknowledged as having great gains through containerization. Much effort has already been expended in the study of containerization of ammunition, and as figures in this thesis indicate, a sizable proportion of DoD-use containers will be for this purpose.

Connectivity with the commercial system for the containerization and transport of ammunition is observed with the use of ammunition containers (AMCON's), Load and Roll pallets (LRP), half-heights, commercial TEU's, and the Palletized Loading System (PLS).

A critical lesson learned from Operations Desert Shield and Desert Storm was the need to increase Combat Support (CS) and Combat Service Support (CSS) levels during the earliest stages of an operation. These echelons are absolutely essential in order to have an infrastructure in place and ready for the support of combat operations. CS and CSS units have much higher percentages of equipment that is containerizable than combat units. For this reason, during surge periods, containerships are a logical method with which to deploy these units, while the Roll-On/Roll-Off and FSS's are reserved to transport combat units, which have high percentages of rolling stock.

Deploying CS and CSS units in the first surge will help establish an intermodal network. Intermodal infrastructure is necessary for successful containerization. Container support infrastructure will be a high value target to the enemy. The lack of an intact intermodal infrastructure will seriously degrade the effectiveness of containers and the ability of our forces to conduct their mission. It is essential that the support infrastructure be in place in order to support the combat elements, and the warfighers must recognize this need.

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